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Including the Proceedings of the
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XV FEBRUARY 8, 1926 NUMBER 2

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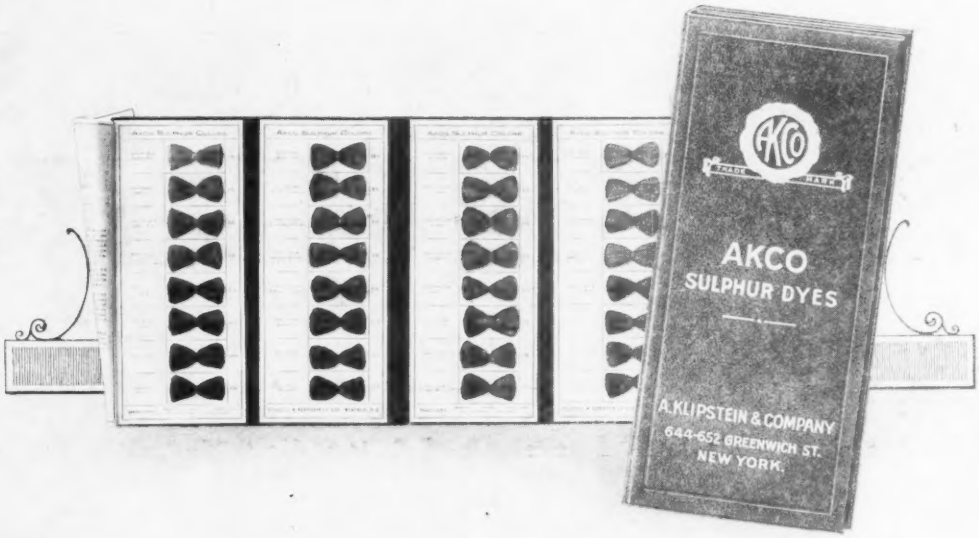

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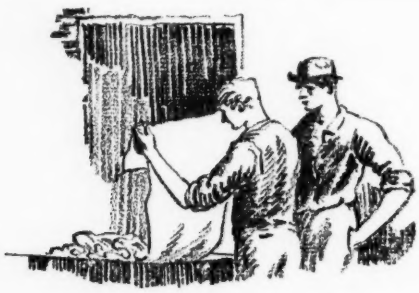

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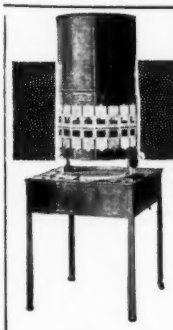

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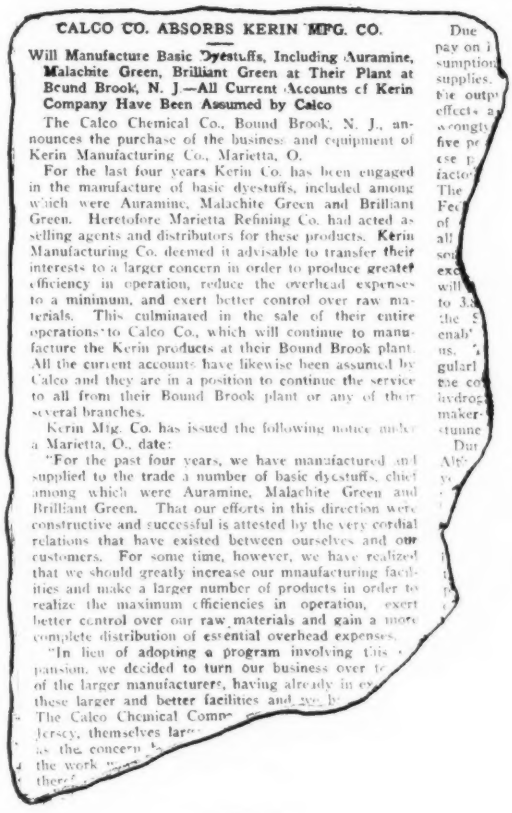

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Kerin Mfg. Co. has issued the following notice under a Marietta, O., date:

"For the past four years, we have manufactured and supplied to the trade a number of basic dyestuffs, chief among which were Auramine, Malachite Green and Brilliant Green. That our efforts in this direction were constructive and successful is attested by the very cordial relations that have existed between ourselves and our customers. For some time, however, we have realized that we should greatly increase our manufacturing facilities and make a larger number of products in order to realize the maximum efficiencies in operation, exert better control over our raw materials and gain a more complete distribution of essential overhead expenses.

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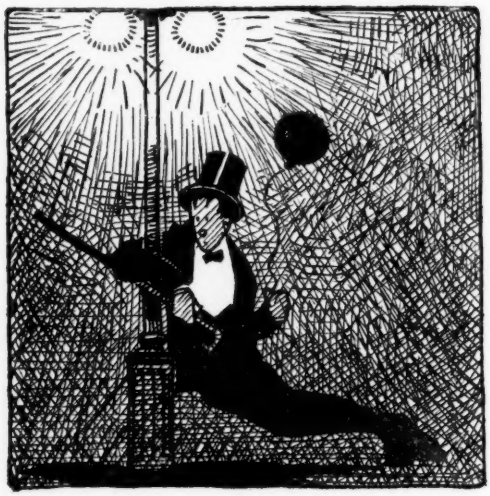

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Contents of This Issue

February 8, 1926

The History and Development of Bronze Printing 77
Oskar Gaumnitz

Acetate Silk—Its Dyes and Their Application—Part VI 81
Charles E. Mullin

The Dyer's School of Experience: Tracing Complaints That Nearly Cost a Job 86
Noel D. White

Proceedings of the American Association of Textile Chemists and Colorists

December Meeting of the Rhode Island Section 89

January Meeting of the Rhode Island Section 89

Communication.
The Fastness of Dyes to the Influence ence of Light 90
Dr. R. E. Rose

Applicants for Membership..... 92

Changes of Address..... 92

Resignations 92

Editorials:
Inconsistent Efficiency—A Story for Rayon Manufacturers 93

Leaders Must Lead..... 93

Calco Absorbs Kerin Manufacturing Co.. 94

Men of Mark:
Axel J. Jorgensen..... 95

A Description and Use of Cruger's Micro-Analyser 96

The Reduction Products of Azo Dyes—Part VIII 100
Walter C. Holmes

Dyestuff Tables 102

Technical Notes from Foreign Sources... 105

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VOLUME XV NEW YORK, FEBRUARY 8, 1926 NUMBER 2

The History and Development of Bronze Printing

Early Practices—Bronze Printing with Solutions of Albumen, Glue or Casein—With Varnishes, Lacquers or Resins—With Bakelite Compounds—With Rubber Solutions—With Solutions of Cellulose

By OSKAR GAUMNITZ

Translated from Melliand's Textilberichte, December, 1925, by Carl Toepler

THE production of bronze effects on textile fabrics is an art practised since the beginning of calico printing for the beautifying of printed styles.

The discovery of bronzes, originally prepared from pure gold and later from alloys similar to brass, is closely related to the metal-beating industry for the production of thin metal leaf. The art of beating metal was discovered at Fuerth, Germany. The first metal-beating establishment was founded in 1705 at Fuerth by Hans Meyer. The filings obtained in the cutting of the metallic leaves were of no use until an inventive stonemason (Albert Huber, of Fuerth) discovered a means of preparing metallic powder—bronzes—from the filings. The inventor could not make use of his discovery, as he soon died in poverty. The first company for the preparation of bronzes in large quantities was the firm of Segnitz & Neidhardt, of Fuerth. The filings were pulverized by hand by rubbing between two marble stones. Later, about 1781, a metal beater, Konrad Pickel, and a Frenchman named Courir were able to prepare an alloy resembling gold, from which they were able to make a gold-colored powder. Martin Holzinger, a gold paper manufacturer, discovered a method of coloring the bronze to various shades by heating.

The manufacture of bronzes to-day is being carried out in essentially the same way. The grinding of the metal is not possible, due to the "balling" together of the particles. The alloys are first converted into thin leaves, then resolved into bronze powders by rubbing and beating. Alloys of copper, tin and zinc are used for such colors as red, orange, gold, yellow and light green. For silver, aluminum powder is used exclusively and, with certain precautions, may be colored to all shades. The coloring of aluminum bronze is done with alcoholic solutions of basic dyestuffs. After evaporation of the alcohol the bronze is treated with an alcoholic tannin solution. These two processes can also be carried out in the reverse order. The dyeing of bronzes requires considerable experience, since a poorly dyed color lake may be removed in the subsequent polishing of the bronze.

The application of bronzes in calico printing was first attempted by the well-known calico printer Johann Heinrich Edler von Schuele, of Augsburg, and developed to a high degree. The gold and silver bronzes were painted on the printed patterns with a brush. From the factory of Schuele the process of gold and silver painting was later introduced at the works of Schoepper & Hartmann, of Augsburg (established in 1781). Very beautiful and valuable materials were produced in this manner at the latter works under the direction of W. H. von Kurrers in the year 1818 in the form of gold and silver painted draperies for the Escurial palace in Spain.

It is quite interesting to read of the first application of bronzes by Kurrer in the little known work of the latter:[1]

"The art of decorating printed cotton goods with gold and silver figures by the use of brushes was discovered by the nestor of all European calico printers, Johann H. von Schuele, who introduced the process into his world-renowned establishment nearly 100 years ago (written in 1862). He applied his discovery not only to the shading of the printed portions but also as solid designs on the white and colored grounds of his fast-colored printed pieces."

The girls employed in the painting were known as "Augsburger Schildermaedchen." Their director (Madam Friedrich, of Hamburg) ranked high as an artist in her profession. The decorated pieces found a ready sale in Spain, Italy, the Orient and all over Germany.

Kurrer continues:

"At first, Schuele used the highest quality of finely prepared matte gold in powder form, well washed in water and costing 30 to 58 gulden per pound. For use in paint-

ing, the gold is rubbed together with some gum-arabic solution in a porcelain mortar until it forms a syrup. It is now repeatedly washed, until the water becomes clear and colorless. A pound of gold loses through these operations 4 loth (about 40 grams) of its weight, and is now the pure matte gold ready for use. One person cannot grind and purify more than 2 loth of gold daily. For uniform results it is always advisable for one to prepare the pure matte gold, since that occurring in commerce is never quite pure and therefore, for use in painting, must be ground and washed.

"The ground and washed product is now mixed with the clear gum-arabic solution, allowed to stand for a day, after which it is suitable for painting. If it is desired to keep this prepared gold it is mixed with clear water. On using, the water is poured off and the gold stirred together with some gum solution, or it may be dried until ready for use, when it is again treated with the gum solution. The silver used in painting woven fabrics is prepared in the same manner as the gold.

"The painting brushes must be strong and pointed, and the gold or silver must flow as easily from the brush as any other good gum color. The finished pieces after drying are calendered, the gold or silver painted on and finally polished by calendering, the metallic luster being obtained in this manner.

"In later times this method was given up on account of high artist's wages, the printing with blocks where gold and silver figures were required taking its place. Of course, in this way the delicate figures could not be produced as in painting by hand, and also much color was consumed in the printing."

In the early days the brush and hand block were depended on for the application of bronzes, but conditions changed with the introduction of roller printing. The problem of preparing the bronzes could be considered solved; on the other hand, the question of the most suitable fixing agent still remained. The gum in use in hand painting could not be used in roller printing on account of the poor fastness to rubbing. The fixing agents for pigments were next tried for bronze printing. Glue, albumen and casein were the substances first tried. The rapid decomposition of these fixing agents made the process unpopular, and the drying oils, varnishes, resins and finally rubber solutions were given attention. Better results were obtained with these materials, and even to-day quite a fast print may be obtained in this manner. In recent years the so-called synthetic varnishes from phenol-formaldehyde condensations (Bakelite) have been used. This latter method appeared promising. Finally, the fixing of the bronzes by solutions of cellulose and its esters was tried, a method that has proven quite useful.

The following are the most important methods of fastening bronzes on woven fabrics, the obsolete methods also being given. They are classified according to the kind of fixing agent used:

1. Bronze printing with solutions of albumen, glue or casein.
2. Bronze printing with varnishes, lacquers or resins.
3. Bronze printing with rubber solutions.
4. Bronze printing with Bakelite compounds.
5. Bronze printing with solutions of cellulose or cellulose esters.

In printing with intaglio engraving certain rules must be followed. The engraving must be kept deep. The bronzes to be used must be finely divided. Coarse bronzes separate in the printing paste. For this reason the bronzes prepared from aluminum are preferred to those of other metals. There are no aluminum bronzes for yellow, gold or red in commerce, but alloys for these colors exist in finely powdered form. Before printing, the print colors must be ground for some time in a grinding mill. With colored aluminum bronzes this must not be overdone, as the dyestuff-tannin lake may rub off. The print colors are kept as thick as possible to use, since in this condition the bronze remains better in suspension in the fixing agents. After printing, it must be remembered, the high luster of the bronzes is obtained only by calendering with friction.

Bronze Printing with Solutions of Albumen, Glue or Casein

Since bronzes can be fixed like pigment colors, the easy coagulating property of albumen was first investigated. This substance is well adapted for use with light bronzes; with the heavier bronzes, as were formerly quite common, the thickening in use was not of such viscosity as to hold the bronze in suspension for any length of time. Additions were therefore made to overcome this difficulty. For example, gum water, dextrine, British gum, etc., were added to the albumen solution. The binding power of the fixing agent was considerably lowered by these additions. To-day, with light aluminum bronzes in commerce, this difficulty is removed.

The fixing agent most used is albumen. For bronze printing only the best grades of light egg and blood albumen can be considered. A mixture of both is often used. The following are useful thickenings:

1. 400 gm. light blood albumen
   570 gm. cold water
   30 gm. turpentine

   1,000

2. 230 gm. egg albumen
   170 gm. blood albumen
   570 gm. cold water
   30 gm. turpentine

   1,000

To obtain better solution, an addition of 10 to 20 gm. aqueous ammonia is often made. The printing color is then made up as follows:

300 gm. bronze powder
100 gm. glycerine
600 gm. albumen solution, No. 1 or 2

1,000

or:

300 gm. bronze powder
100 gm. glycerine
100 gm. gum solution 1:1
500 gm. albumen solution, No. 1 or 2

1,000

The latter recipe is suitable for heavy bronzes.

After printing, the goods are well dried and steamed in a cottage or continuous steamer for twenty to thirty minutes. The prints possess good fastness to washing and are sufficiently fast to rubbing.

The aluminum bronze colors may also be used for discharge styles. To obtain color effects, basic colors fast to hydrosulphite are added to the bronze printing color. The following is a suitable recipe:

100—150 gm. Rongalite C
150—150 gm. water
25— 25 gm. glycerine
20— 30 gm. basic dyestuff
80— 70 gm. water
Heat to dissolve, cool and add:
100—100 gm. aluminum bronze
525—475 gm. egg albumen solution (3:2)

1,000

The prints are handled in the same manner as color discharges.

Casein solutions are not suitable for fast bronze prints. Since casein is cheaper than egg albumen, the former is used for styles not requiring a high degree of fastness to rubbing. The following is a suitable recipe:

200—300 gm. bronze powder
50—100 gm. glycerine
100—100 gm. gum-arabic solution 1:1
650—500 gm. casein solution

1,000

Casein solution:

150 gm. casein (soluble in alkali)
840 gm. cold water
10 gm. ammonia water

1,000

After printing and drying, steam twenty to thirty minutes without pressure. Casein was formerly used for the fixation of a silver-like metal that went under the designation of "Argentin." This substance was a finely divided metallic tin, precipitated from stannous solutions by means of metallic zinc. Argentin, thickened with casein solutions, printed and dried, was given a luster by friction calendering. The printing color, however, worked badly, remained in the engraving, and damaged both roller and doctor. At the present time Argentin has been entirely replaced by aluminum powder.[2]

Animal glue, used in the form of gelatine, is of greater importance for the fixing of bronzes. Three hundred and sixty grams gelatine are treated with six hundred and forty grams water and allowed to soak and then heated.

The printing color is composed of:

150—200 gm. bronze powder
850—800 gm. above gelatine solution

1,000

This printing color must be used hot. The color box for this purpose has a double wall; steam or hot water is circulated between the walls. The fastness to rubbing can be increased by an aftertreatment with formaldehyde vapors (for example, in the Mather-Platt). However, a mere drying is often sufficient.

Bronze Printing with Varnishes, Lacquers or Resins

The method of fixing bronzes with resinous substances that harden on cooling or on exposure to air is very old. For example, metal leaf and, later, metal powder were applied in the following way: The fabric was dusted with resin powder on the portions which were to be printed. The latter were covered with metal leaf or metal powder, and then a heated stamp containing the design was applied to the cloth. The resin melted at the heated portions and, on cooling, fastened the bronze. The excess resin and bronze were then removed by brushing. Even today this method is used for the stamping of decorative designs on the ends of bolts of cloth. For this purpose bookbinder's presses are used. On account of its limitations the method never came into use in calico printing.[3]

It soon became possible to print and fasten on the fiber bronzes mixed with varnishes, lacquers and resin solutions. In all the numerous well-known recipes, the principal factor is the suitability of the binding materials. The varnishes, copal lacquers, etc., in use must possess high thickening power and dry rapidly. Such varnishes in suitable quality are not available. The following is a recipe for a good printing color:

240 gm. bronze powder
325 gm. thick varnish
325 gm. copal lacquer
110 gm. turpentine

1,000

This color is well ground in a grinding mill before use. After printing, the goods are hung up at 30 to 40 deg. Cent. for a few days, during which time the bronze becomes fixed through the hardening of the varnish and lacquer. In order to remove the adhering odor the goods, after drying, are run through the finishing materials; or, where this is unnecessary, through water, and then dried. The remainder of the turpentine is removed in this manner. This method has proved particularly useful with fine patterns.[4]

The preceding recipe is often modified by the addition of resins, mastic, sandarac, rubber solutions, etc. It would consume too much space to consider all the recipes given in the literature.[5]

Solutions of shellac in borax were formerly used as fixing agents.[6] The thickening was printed on the fabric and the moist portions dusted with bronze powder, behind the printing machine.

After this treatment the excess bronze powder was removed by beating and brushing. The shellac thickening could also be mixed with the bronze and printed. The fastness to rubbing of these prints was poor.

Bronze Printing with Rubber Solutions

This method has also become absolete. Vulcanized rubber waste is dissolved by heating with camphor oil and naphtha, and diluted with copal varnish. This thickening is used with the bronze at the rate of 150 to 200 gm. of bronze per kilo of printing paste. During printing it is necessary to make additions of benzine to prevent the paste from becoming thicker. Fixing resulted by the evaporation of the solvents.

In 1907, M. Caux described a process that depended on the use of rubber solutions but permitted the use of other colors.[7] The bronze part of the pattern was printed with a stick mass composed of gutta-percha, rubber and Flemish glue. After printing and drying, the goods were steamed, washed, soaped and dried for the fixation and development of the other colors. The goods were then passed over a hot cylinder, whereby the sticky mass became soft. In this condition the goods passed through a box containing a revolving brush and the bronze powder. The dusting of the sticky patterns resulted in obtaining the desired effect. Upon drying, the bronze became fixed.

Bronze Printing with Bakelite Compounds

About fifteen years before Bakelite became known, the condensation products of formaldehyde and phenols and amines were investigated for the fixation of bronzes on the fiber. On September 7, 1901, J. Stephan described a method in a sealed report to the Mulhouse Society, in which he prepared, though unknowingly, substances of a Bakelite nature. He prepared a thickening of glue, resorcin and hexamethylenetetramine (formaldehyde-ammonia), which he recommended for the fixing of bronzes.

The firm of J. Heilmann, working in conjunction with H. Wagner and M. Lattegay, introduced a method employing the condensation product of phenol and formaldehyde in connection with a solution of sericose (acetyl cellulose solution).

100—150	gm. Sericose L (Bayer)
500—450	gm. phenol
500	gm. formaldehyde
50	gm. sodium acetate

are heated together for some hours on a water bath. The bronze powder is added and the mixture printed. The mixture is heated just so long that an ordinary steaming in the Mather-Platt is sufficient for the formation of the Bakelite. The prints only require a short steaming for the complete fixation.

The formaldehyde vapors given off during the printing were one of the disadvantages of this method.[8]

The Farbenfabriken vorm. Fried. Bayer & Co., Leverkusen, distributed a shade card (1913, No. 2216) in which prints produced in this manner are shown. For dissolving the sericose, Bayer recommended the following recipe:

120	gm. Sericose L
470	gm. alcohol
300	gm. formaldehyde 40 per cent
110	gm. phenol
1,000	

To this thickening is added 150 gm. gold bronze. A short steaming (four minutes) in the rapid ager fixes the prints. Another method, employing formaldehyde-phenol condensation products, was patented by E. Zuendel, of Moscow (D. R. P. 264,137; December 3, 1912): 400 gm. phenol 90 per cent, 600 gm. formaldehyde 36 per cent and 40 gm. potassium sulphite are cooked for one to two hours in a steam-jacketed kettle while stirring; 750 gm. of a condensation product is formed, to which 250 gm. of phenol are added; 350 gm. bronze powder are added to 650 gm. of the above thickening. The print colors are diluted with acetone, alcohol, phenol or glycerine until the proper consistency for printing is reached. A rapid aging fixes the prints. The patent protects also the condensation products of formaldehyde and other phenols and amines.[9]

Bronze Printing with Solutions of Cellulose or Cellulose Esters

The solutions of cellulose and its esters are very viscous liquids, and can be precipitated by merely evaporating the solvents. This fact makes it possible to fasten pigments and bronzes. The most important methods follow:

(*Continued on page* 103)

Acetate Silk—Its Dyes and Their Application

Part VI

SUPPLEMENTAL TO THE PRECEDING SERIES OF ARTICLES ON DYEING ACETATE SILK

Various Shades with SRA Dyes on Celanese—Celanese-Cotton Unions and Knit Goods—Dyeing Methods for Union Goods

By CHAS. E. MULLIN, M.Sc., F.A.I.C.

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IN Part XI of "Dyeing Acetate Silk" (AMERICAN DYESTUFF REPORTER, 1925, page 519), a few dye formulas were given for various shades with the SRA dyes upon Celanese. The following formulas are of even more interest as some of these formulas have superseded those previously given:

Formula No. A11—Fawn

1.30 per cent SRA Blue III paste,
0.50 per cent SRA Golden Orange VIII paste, and
0.60 per cent SRA Golden Orange I paste.

Enter cold and raise to 70 deg. Cent. (158 deg. Fahr.) in an hour and a half.

Formula No. A12—Gray

1.15 per cent SRA Blue III paste,
0.21 per cent SRA Orange I paste, and
0.22 per cent SRA Golden Yellow VIII paste.

Dye at 80 deg. Cent. (176 deg. Fahr.) for an hour.

Formula No. A13—Medium Gray

1.00 per cent SRA Blue III paste,
0.25 per cent SRA Golden Yellow IX paste,
0.08 per cent SRA Orange I paste.

Enter cold and raise to 80 deg. Cent. (176 deg. Fahr.) in three-quarters of an hour and dye for three-quarters of an hour.

Formula No. A14—Light Gray

0.036 per cent SRA Golden Yellow IX paste,
0.016 per cent SRA Blue IV paste, and
0.18 per cent SRA Heliotrope I paste.

Formula No. A15—Dark Gray

0.17 per cent SRA Golden Yellow IX paste,
0.08 per cent SRA Blue IV paste, and
0.10 per cent SRA Heliotrope I paste.

Prepare the dye bath with 1 g. of olive oil soap and 0.25 g. of soda ash per liter. Dye at 80 deg. Cent. (176 deg. Fahr.) for three-quarters of an hour. After dyeing soap for a half hour in a bath containing 2 g. of soap and 2 c.c. of ammonia per liter at 60 deg. Cent. (140 deg. Fahr.).

Formula No. 16—Leaf Brown

1.50 per cent SRA Golden Orange I paste,
0.30 per cent SRA Blue III paste, and
0.25 per cent SRA Red I paste.

Dye at 80 deg. Cent. (176 deg. Fahr.) for an hour.

Formula No. A17—Golden Brown

7.00 per cent SRA Orange II paste,
2.50 per cent SRA Golden Yellow VIII paste, and
2.00 per cent SRA Blue III paste.

Enter cold and raise to 75 deg. Cent. (167 deg. Fahr.) in an hour and a half.

Formula No. A18—Nigger

4.00 per cent SRA Golden Yellow VIII paste,
6.00 per cent SRA Orange II or Red I paste, and
12.00 per cent SRA Blue III paste.

Enter cold and raise to 80 deg. Cent. (176 deg. Fahr.) in two hours.

Formula No. A19—Red

4.00 per cent SRA Orange I paste, and
2.00 per cent SRA Red I paste, with
1.10 per cent Rosaniline Base NSF 100% (See Method No. 80).

Enter cold and raise to 75 deg. Cent. (167 deg. Fahr.) in two hours.

Formula No. A20—Reseda

3.80 per cent SRA Golden Yellow IX paste,
1.00 per cent SRA Golden Orange I paste, and
2.50 per cent SRA Blue IV paste.

Enter cold and raise to 80 deg. Cent. (176 deg. Fahr.) in an hour and a half.

Formula No. A21—Sky to Light Blues

0.25 per cent to 2.50 per cent SRA Blue IV paste.

Enter cold and raise to 80 deg. Cent. (176 deg. Fahr.) in an hour and a half.

Formula No. A22—Reddish Violet

5 per cent SRA Violet II paste, and
5 per cent SRA Heliotrope I paste.

Enter cold and raise to 75 deg. Cent. (167 deg. Fahr.) in an hour and a half.

Formula No. A23—Whirlpool

16.50 per cent SRA Blue IV paste and
3.20 per cent SRA Pure Yellow II paste.

Enter cold and raise to 75 deg. Cent. (167 deg. Fahr.) in two hours.

Formula No. A24—Navy Blue

25.00 per cent SRA Blue III paste,
4.00 per cent SRA Golden Yellow IX paste, and
4.00 per cent SRA Orange II paste.

Enter cold, raise to 80 deg. Cent. (176 deg. Fahr.) in an hour and dye at this temperature for an hour.

Formula No. A25—Deep Saxe

7.00 per cent SRA Blue IV paste.

Formula No. A26—Pongee

0.10 per cent SRA Orange I paste,
0.24 per cent SRA Golden Yellow IX paste, and
0.244 per cent SRA Blue III paste.

Formula No. A27—Bright Golden Brown

7.00 per cent SRA Orange II paste,
2.50 per cent SRA Golden Yellow VIII paste, and
2.00 per cent SRA Blue III paste.

Enter cold and dye at 75 deg. Cent. (167 deg. Fahr.) for an hour and a half.

Formula No. A28—Pink for Underwear Only

1.00 per cent to 10.00 per cent Pink II paste.

Formula No. A29—Violet-Red

5.00 per cent SRA Red V paste.

Formula No. A30—Scarlet

5.00 per cent SRA Red I paste.

Formula No. A31—Deep Crimson

1.20 per cent SRA Red V paste, and
6.00 per cent SRA Red III paste.

Formula No. A32—Orchid

1 00 per cent SRA Heliotrope I paste.

Formula No. A33—London Lavender

0.60 per cent SRA Heliotrope I paste, and
0.06 per cent SRA Blue III paste.

Formula No. A34—Pale Reddish-Gold

1.00 per cent SRA Golden Yellow IX paste, and
0.20 per cent SRA Heliotrope I paste.

Enter cold and raise to 75 deg. Cent. (167 deg. Fahr.) fr an hour or an hour and a half.

Formula No. A35—Champagne

2.000 SRA Golden Yellow IX paste, and
0.015 per cent SRA Blue III paste.

Formula No. A36—Mauve

0.70 per cent SRA Heliotrope I paste, and
0.70 per cent Violet I paste.

Formula No. A37—Nude

0.075 per cent SRA Golden Yellow IX paste, and
0.005 per cent SRA Red I paste.

Formula No. A38—Sunburn

0.10 per cent SRA Blue III paste,
0.02 per cent SRA Red I paste, and
0.08 per cent SRA Golden Yellow IX paste.

Formula No. A39—Silver

0.30 per cent SRA Blue III paste,
0.08 per cent SRA Golden Yellow VIII paste, and
0.03 per cent SRA Heliotrope I paste.

Celanese-Cotton Unions and Knit Goods

The American Cellulose & Chemical Company now recommend the following process for black on Celanese-cotton hosiery and knit goods, stating that when the SRA Fast Black Developer HY Special is used, it is no more difficult to obtain a fast black on these mixed goods than to obtain a developed black upon cotton alone. The only difference between this process and that generally used for cotton is that the acidified developing bath is used warm, instead of cold.

Method No. 136: Developed Black on 50-50 Celanese and Cotton Knit Goods.—Enter the goods into a twenty to one dye bath at 45 deg. Cent. (113 deg. Fahr.) containing 10 per cent of SRA Black IV and 4 to 6 per cent of Chlorazol Black LF or Diamine Fast Black C conc. Raise the temperature during an hour or an hour and a half to 75 deg. Cent. (167 deg. Fahr.), adding 40 per cent of sodium chloride in portions. Rinse the goods before diazotizing.

Method No. 136.1: Diazotizing Black on Knit Goods.—Diazotize the goods in a twenty to one bath for one hour with 5 per cent of 98 per cent sodium nitrite and 14 per cent of 28 per cent hydrochloric acid.

Method No. 136B: Developing Black on Knit Goods.

—Dissolve 1 to 1.5 per cent of caustic soda, on the weight of the fiber, in water and work 2 or 3 per cent of SRA Black Developed HY Special into a paste with it, adding hot water to complete the solution. Dissolve 5 per cent of glue, also on the weight of the fiber, in water and add it to the twenty-five to one developing bath, then add the dissolved developer to the bath. Lastly add 5 per cent of 80 per cent formic acid to the bath and stir well. Enter the goods and raise the temperature to 60 deg. Cent. (140 deg. Fahr.) during an hour. When the developer is complete, rinse in water at about 45 deg. Cent. (113 deg. Fahr.), then in cold water, and finally soap well in a bath containing 0.5 per cent to 1 gram per liter of olive oil soap. Then rinse well again.

In dyeing Celanese or mixed hosiery or other knit goods which may have seams which are difficult to penetrate, a steeping operation is of great benefit in leveling, etc., especially in machine dyeing. It also aids in penetrating the cotton at the restricted dyeing temperature of 80 deg. Cent. (176 deg. Fahr.). The steep may be either cold or warm, either overnight or for a shorter period. Frequently the goods are simply allowed to remain in the scouring bath overnight with excellent results.

In dyeing Celanese unions, good results may be obtained either by entering the goods cold and raising the temperature of the dye bath to 75 or 80 deg. Cent. (167 or 176 deg. Fahr.); or by entering the goods directly into the dye bath at this temperature, adding half of the cotton dye and all of the SRA dye at the start, with subsequent additions of cotton dye and salt as required. The dye bath should be set with about 0.5 gram per liter of olive oil soap and 1 c.c. per liter of Turkey Red oil or Celascour. A dyeing temperature of 60 to 80 deg. Cent. (140 to 176 deg. Fahr.) is used for an hour or two, or until the desired shade is obtained. After dyeing the material should be given a light soaping for ten minutes in a bath containing about 1.5 grams per liter of olive oil soap at 45 deg. Cent. (113 deg. Fahr.). In addition to the dye formulas for Celanese-cotton unions given in Part XI, of "Dyeing Acetate Silk" (AMERICAN DYESTUFF REPORTER, 1925, page 521), the following formulas may be of interest for 50-50 unions:

Formula No. U-19—Light Gray

1.00 per cent SRA Blue III paste,
0.25 per cent SRA Golden Yellow IX paste, and
0.08 per cent SRA Orange I paste.
0.30 per cent CR Cotton Fast Gray B, and
10.00 per cent Glauber salt.

Enter cold and raise to 80 deg. Cent. (176 deg. Fahr.) in forty-five minutes. Dye at this temperature for forty-five minutes.

Formula No. U20—Pale Gold

1.00 per cent SRA Golden Yellow IX paste, and
0.20 per cent SRA Heliotrope I paste,
0.005 per cent CR Cotton Fast Yellow B, and
0.04 per cent CR Cotton Fast Brown R.

Enter cold and raise to 70 deg. Cent. (158 deg. Fahr.) for about two hours.

Formula No. U21—Fawn

0.40 per cent SRA Blue III paste,
0.65 per cent SRA Golden Yellow IX paste, and
0.04 per cent SRA Red I paste.
0.05 per cent CR Cotton Fast Brown R,
0.04 per cent Chlorazol Fast Yellow B, and
5.00 per cent Glauber salt.

Enter cold and raise to 75 deg. Cent. (167 deg. Fahr.) in an hour and a half.

Formula No. U22—Tangerine

3.50 per cent SRA Golden Yellow IX paste, and
2.75 per cent SRA Red I paste.
1.30 per cent CR Cotton Fast Scarlet 4BS,
1.30 per cent CR Cotton Fast Yellow B, and
10.00 per cent Glauber salt.

Enter cold and raise to 80 deg. Cent. (176 deg. Fahr.) in forty-five minutes and hold at this temperature for forty-five minutes.

Formula U-23—Apple Green

0.95 per cent SRA Pure Yellow II paste, and
0.12 per cent SRA Blue IV paste.
0.05 per cent CR Cotton Fast Blue FF,
0.125 per cent CR Cotton Fast Yellow A, and
10.00 per cent Glauber salt.

Enter cold and raise to 75 deg. Cent. (167 deg. Fahr.) in an hour.

Formula No. U24—Light Blue

2.50 per cent SRA Blue IV paste,
0.75 per cent CR Cotton Blue FF, and
10.00 per cent Glauber salt.

Enter cold and raise to 75 deg. Cent. (167 deg. Fahr.) in an hour and a half.

Formula No. U25—Dark Beaver

1.40 per cent SRA Blue III paste,
4.60 per cent SRA Golden Yellow VIII paste, and
0.30 per cent SRA Red I paste.
2.00 per cent CR Cotton Fast Brown R, and
0.20 per cent CR Cotton Fast Blue FF.

Enter cold and raise to 80 deg. Cent. (176 deg. Fahr.) in forty-five minutes and dye at this temperature for forty-five minutes.

Some formulas suitable for use upon hosiery unions were given in Part XII of "Dyeing Acetate Silk" (AMERICAN DYESTUFF REPORTER, 1925, page 556). The following are more recent additions to this list.

Formula No. HU8—Silver

0.30 per cent SRA Blue III paste,
0.08 per cent SRA Golden Yellow VIII paste, and
0.03 per cent SRA Heliotrope I paste.
0.10 per cent Chloramine Fast Gray R, and
5.00 per cent Glauber salt.

Formula No. HU9—Maize

3.20 per cent SRA Golden Yellow IX paste, and
0.12 per cent SRA Orange L paste.
1.50 per cent CR Cotton Fast Yellow B,
0.16 per cent CR Cotton Fast Orange 5R, and
0.04 per cent CR Cotton Fast Blue FFB.

Formula No. HU10—Nude

0.075 per cent SRA Golden Yellow IX paste, and
0.005 per cent SRA Orange I paste.
0.005 per cent CR Cotton Fast Orange 5R,
0.005 per cent CR Cotton Fast Scarlet 4BS, and
20.000 per cent Glauber salt.

Formula No. HU11—Stone

0.30 per cent SRA Blue III paste,
0.80 per cent SRA Golden Yellow IX paste, and
0.20 per cent SRA Heliotrope I paste.
0.06 per cent CR Cotton Fast Brown R,
0.01 per cent CR Cotton Fast Gray B, and
5.00 per cent Glauber salt.

Formula No. HU12—Putty

0.40 per cent SRA Blue III paste,
0.50 per cent SRA Golden Yellow IX paste, and
0.06 per cent SRA Heliotrope I paste.
0.015 per cent CR Cotton Fast Gray B,
0.003 per cent CR Cotton Fast Brown R,
0.001 per cent CR Cotton Fast Yellow B, and
5.00 per cent Glauber salt.

Formula No. HU13—Flesh

0.15 per cent SRA Orange L paste,
0.0072 per cent CR Cotton Fast Brown R, and
0.0004 per cent CR Cotton Fast Scarlet.

Formula No. HU14—Mushroom

0.30 per cent SRA Blue III paste,
0.10 per cent SRA Golden Yellow IX paste, and
0.01 per cent SRA Red I paste.
0.01 per cent CR Cotton Fast Gray B,
0.003 per cent CR Cotton Fast Yellow B,
0.001 per cent CR Chlorazol Fast Red BL, and
5.00 per cent Glauber salt.

Formula No. HU15—Cinnamon

0.60 per cent SRA Blue III paste,
6.00 per cent SRA Golden Yellow IX paste, and
0.90 per cent SRA Heliotrope I paste.
0.45 per cent CR Cotton Fast Brown R, and
10.00 per cent Glauber salt.

Formula HU16—Nigger

15.00 per cent SRA Blue III paste,
10.00 per cent SRA Golden Yellow VIII paste, and
0.50 per cent SRA Red I paste.
4.00 per cent CR Cotton Fast Brown R,
0.30 per cent CR Cotton Fast Blue FFB, and
20.00 per cent Glauber salt.

Formula HU17—Navy

25.00 per cent SRA Blue III paste,
4.00 per cent SRA Golden Yellow IX paste, and
4.00 per cent SRA Orange II paste.
2.50 per cent CR Cotton Diazo Black BH, and
20.00 per cent Glauber salt.

Celanese-Wool Unions

In dyeing unions of Celanese and wool or real silk by Method No. 137 the following dyes are suggested. It is, of course, understood that most of the SRA dyes stain wool. As the SRA colors are faster to cross-dyeing than the other colors, it is customary to dye the Celanese first and then dye the wool or real silk.

Mode Shades: Grays, Fawns, Putty, Mole, Etc.

Celanese

SRA Pure Yellow I,
SRA Golden Orange VIII,
SRA Orange II,
SRA Blue III.

Wool or Silk

CR Wool Light Yellow 2G,
CR Wool Red 10B,
CR Wool Pink B,
CR Wool Blue SAP.

Sky Blue and Saxe

Celanese

SRA Blue IV.

Wool

CR Wool Blue SAP.

Lemon Yellow

Celanese

SRA Pure Yellow I or II.

Wool

CR Wool Light Yellow 2G.

Orange

Celanese

SRA Orange I or II.

Wool

CR Wool Crystal Orange.

Green

Celanese

SRA Blue IV, and
SRA Golden Yellow VIII or IX.

Wool

CR Wool Blue SAP, and
CR Wool Light Yellow 2G.

Black

Celanese

SRA Black IV, as in Method No. 135 with *B*-hydroxynaphthoic acid.

Wool

CR Wool Black 10B or 10BW,
CR Wool Red 10B,
CR Wool Light Yellow 2G,

Where it is desired to dye the Celanese and wool or silk in a single bath, Method No. 138 should be used with the following dyes:

GRAY

Celanese

SRA Pure Yellow I,
SRA Golden Yellow VIII,
SRA Orange II,
SRA Violet II,
SRA Blue III,

Wool

Diphenyl Fast Gray B conc.,
Patent Blue No. 9879.

FAWN

Celanese

Same as Gray above.

Wool

Diphenyl Fast Brown GN ext.,
Diphenyl Chlorine Yellow FF,
Shade with Patent Blue if desired.

LEMON

Celanese

SRA Pure Yellow I or II.

Wool

Quinoline Yellow.

RED

Celanese

SRA Red I or III.

Wool

Coomassie Milling Scarlet G,
Brilliant Milling Violet S4B.

GREEN

Celanese

SRA Blue IV,
SRA Golden Yellow VIII.

Wool

Patent Blue No. 9879,
Diphenyl Chlorine Yellow FF, or
Chrysophenine G.

BLUE

Celanese

SRA Blue IV.

Wool

Patent Blue No. 9879,
Brilliant Milling Violet S4B.

NAVY BLUE

Celanese

SRA Blue V,
SRA Red I,
SRA Orange I.

Wool

Coomassie Navy Blue 2RNX,
Shaded with Chrysophenine G if desired.

Method No. 137: Dyeing Celanese and Wool or Real Silk Unions by the Two-Bath Process.—Dye the Celanese first and rinse well. Then dye the wool in a fresh bath containing the wool dye, 10 per cent Glauber salt and up to 4 per cent of formic acid. Enter the goods at 45 deg. Cent. (113 deg. Fahr.) and during a half hour raise the temperature to 80 deg. Cent. (176 deg. Fahr.). Dye at this temperature for an hour and a half to two hours.

Method No. 138: Dyeing Celanese and Wool or Real Silk by the One-Bath Process.—Enter the goods into a cold bath containing the dyestuffs and 10 per cent of Glauber salt. During about two hours raise the temperature to 80 deg. Cent. (176 deg. Fahr.).

The following wool dyes are applicable by Method No. 137:

CR Wool Red 10B
CR Wool Blue R
Coomassie Scarlet 9012K
Coomassie Milling Scarlet G
Coomassie Acid Blue RL
Coomassie Navy Blue 2RNX and G
Coomassie Violet R,
Coomassie Fast Black B
Eosine BS and YS,
Azo Geranine B,
Alizarine Delphinol SE
Disulphine Blue V
Lissamine Violet 2R
Acid Prune V
Lissamine Red 6B

The following dyes may be applied by Method No 138:

Coomassie Navy Blue 2RNX
Coomassie Milling Scarlet G
Quinoline Yellow Extra
Chrysophenine G
Rhodamine B
Acid Milling Black (stains Celanese gray).

(Part VII will appear in an early issue)

GENERAL DYESTUFF BRANCH ADDRESS CHANGES

The General Dyestuff Corporation announces that its Chicago office has moved to 305 West Randolph Street, Chicago, and that its Providence branches have left the Turks Head Building and 56 Pine Street and are both now located at 52 Exchange Place, Providence. The Providence P. O. Box will be 1173 and the telephone numbers Union 4880 and 4881.

The Dyer's School of Experience

TRACING COMPLAINTS THAT NEARLY COST A JOB

By Noel D. White
Davenport Hosiery Mills, Chattanooga, Tenn.

[Editor's Note: *In publishing the following narrative of the author's experience as a dyer The* Reporter *introduces a feature that will undoubtedly be of unusual interest to the majority of its readers. This publication will endeavor to obtain further contributions of a similar nature and publish them under the above head from time to time. Realizing, however, that the genuine material for such a series of experiences is to be found largely among its own readers, The* Reporter *solicits contributions from that source and will pay for those accepted at regular space rates. Among the readers of this journal there should be many who have, in the course of their experience as dyers or chemists, encountered incidents which should prove most interesting and helpful to their fellows. Send all manuscripts to* American Dyestuff Reporter, *90 William Street, New York City.*]

ON Christmas morning, 19—, there appeared in the Paterson Morning Call an advertisement, "Spun Silk Dyer Wanted." I was at that time dyeing ribbons in a small Pennsylvania mill, earning just enough to get along. Having considerable knowledge of spun silk, I answered the ad.

A few days later I received a call for an interview in New York City as soon as I could arrange for the trip. I secured the job, which was in a mill in New England making spun silk to supply knitting and woolen mills. It was explained to me that there was a great demand for fast colors to use in decorating woolen and worsted suiting cloth.

In due time I arrived at my destination. The manager had been instructed by the New York man to take care of my needs and was very pleasant to me, introducing me to the superintendent and directing him to show me my new quarters and everything pertaining to my work.

We adjourned to the dyehouse where I found half a dozen men waiting for someone to give them something to do. In a few words the superintendent explained the situation. They had had a man there for sixteen years who was doing quite well but drink had ruined his eyesight and at last he could not see well enough to match his shades. They had put a man in his place, but he had failed to make good and after keeping him six months finally decided to change again.

Right here I might state that the superintendent and I became fast friends and remained so until long after I left.

The time for action had now come. I entered the dyehouse and ordered my men to clean up every empty vat, throw out all dissolved dyestuffs in crocks and tubs, bleaching and standing baths, boil out in soap and soda every stick and pole, and put the house in order. I took stock of my dyestuff supply and tested out some which I knew would be of value to me. Others I stored out of my way. Then I was ready to work.

This procedure had clearly earned the approval of the superintendent, who was watching my every move, and afterward he never tired of telling me that he knew I would make good because, in his opinion, I had started right.

Testing the Fast Colors

The next morning the manager came to see me and to instruct me in the way the fast colors were to be tested. He explained to me that he had a market for all we could produce, providing we could satisfy the trade. He had some samples in the form of small skeins—blue, red, brown, green, gray, orange, purple—some in one shade, others in several. He proceeded to cut the skeins in twos, putting a knot in the end of each. One was to test out, the other to match after the test to see the result of it. Next, he ordered some boiling water and some dissolved olive oil soap. He filled a beaker with boiling water, poured some soap in it and one at a time immersed the skeins in this solution, squeezing each between the fingers half a dozen times before resting it on the edge of the beaker for a little while. When he had all the colors soaped that way he washed them in two warm waters and rung them.

After drying them, we compared them with the other half and found that all had changed more or less.

"Now," the superintendent said, "if you can dye these colors to stand this treatment as well as these or better, that is what we want."

He said that this silk was to be put in the warps with wool and scoured, fulled or cross-dyed according to the needs of the woolen mills to whom we were going to sell our silk.

In these days the vat colors were just beginning to come into the country. I had once spent a whole day in the laboratory of H. A. Metz & Co. in New York to learn how to dissolve and apply the Helindone colors, and also had visited the laboratory of the Bayer Company for a demonstration of the use of Algol colors, so I spoke to him about them, but he did not think that they were the colors to use. The Alizarines, which I knew would serve quite well, were rejected for the reason that he did not want to put in any extra vats for mordanting. I decided, therefore, on Primuline, some substantive colors, and different developers for the reds, oranges, and yellow, Victoria Blue, green crystal, and Methyl Violets aftertreated with tannic acid and tartar emetic for blue, green and purple. With Malta Gray and Catechine Brown, some Janus colors for shading, I believed that I had a line to fit any purpose.

I asked permission to go to Boston, the nearest city,

to purchase some of the colors, and brought them back in order to start work at once.

I had no difficulties in bleaching and white (the bulk of the work at that time consisted of this), and with some of the colors for knitting mills which required no special fastness.

As they had lost some trade among woolen mills because my predecessor did not give satisfaction, I started making some samples in the shades most in demand just then, and drew considerable praise at the start. According to our tests they were pronounced good and the mill succeeded in placing some good-sized orders.

Trouble Starts

We were sailing with the wind for a time. Then trouble started. I began having numerous complaints every day; some colors were rejected, others had gone into the goods and changed different from the pattern. The manager would come down to the dyehouse with some of my dyed silk to test it with his boiling soap in the way I explained above and could find no reason to complain. He was puzzled and so was I. The customers were not satisfied, and that was the main point. To be sure, not all of the colors were rejected. The reds, oranges and browns were all right, but at one time it would be the blue, and at another the purple or the green I never could tell what to expect from any of these shades. Sometimes the complaint would come from one mill, sometimes from another. To me, all the colors were as per instructions and correct. I could not find what was wrong. The rejected silk was piling up and at the end of six months I felt that the end was near and that as a dyer I was a failure. But was I? Or could not someone else be to blame? I continued to study the problem, still holding out hope for a solution.

I had become friendly with the stenographer in the mill office. One day, when no one was in the office, she called me up and confided to me that the manager had asked for my dismissal, and that she knew it was not my fault if there were so many complaints and rejected shipments. She informed me that she knew the manager did not know what the trade required in fast colors, and that he had hired another man to take my job as soon as he had received an answer from New York.

The same day the superintendent came to me to tell me that there was a dyer in the office that morning to see the manager, and he thought this man would take my place and that he was sorry to see me go. I told him that I had not gone yet and did not intend to be fired so easily. I would do what I could to hold my job because I knew that I could handle it. I had no idea at the time as to what my line of action would be, but I was unwilling to admit myself a failure and felt sure that there must be a way out.

That night I wrote a letter to the New York office telling the man who had hired me that there was not a man in the country who knew more about spun silk dyeing than I, that something was wrong somewhere, and that I should like to have a chance to find out. I promised to resign if I could not find where the trouble was in one month. I got an answer by return mail stating that his confidence was not shaken in spite of the fact that the damage done by the dyehouse in the last six months amounted to a considerable sum of money, but that he wanted me to "go to it" and make good.

Tracing the Elusive Cause

The next day I got an idea. I told the manager that in order to carry out my work successfully, I must know exactly what was required. To find that out I must go to some woolen mill where our silk was used and learn at first hand the operations to which the silk was subjected. When I knew that I would be able to treat my colors accordingly.

He agreed to that and the following morning I traveled to a little town in Massachusetts where a mill was located that had complained most frequently. They had been informed of my coming and the purpose thereof, and at my arrival I was met by a very kind old gentleman who conveyed me to the mill's finishing department where my education in scouring and fulling began.

They told me that they made scouring soap with 2 per cent caustic soda in it. They showed me how they ran their woolen goods in an endless chain, squeezing them between two heavy rollers in a solution of 3 to 5 per cent of their soap at 100 to 120 deg. Fahr. for an hour or longer. I asked them how they used the resist colors and was told that they never needed any resist in their silk even when they cross-dyed, because they used the proper woolen dyes.

When I returned home I tried to scour the colors I had with the two systems—using a sample of their alkali soap and my olive oil soap, boiling as we had done, and found that there was a distinct difference in the results. Where my blue scoured with no change in the neutral soap, when scoured with the alkali soap it showed up darker and reddish, and naturally it had been rejected. And so it was with most of the colors except those developed, which changed but little.

The next day I asked to be sent to another mill where they used resist and cross dyed silk. There I learned considerably more. By the time I was ready to go back to work, I felt sure that my troubles were over. At last I knew where the fault was and could proceed accordingly to correct it.

I attempted to explain to the manager what I had found out, but he cut me short, saying that it was well I had found it out and that I should go ahead and use my judgment.

The work came to the dyehouse with a ticket for every lot. This ticket, if the color was for a knitting mill, would read something like this: Cust. No. 120, size 30/2 color Red-Soft finish. On colors for the woolen trade the ticket would read the same except that a note would be added: "Fast to scouring and fulling"; also, sometimes, "Resist or Cross Dyeing." As some customers did

not want to keep two stocks of colored silk, one to be used with dyed-in-the-yarn wool, the other with cross-dye work, they bought only the latter and made it serve for both purposes. The difference in price was very little. In cases like this I knew I had to give them colors fast to cross dyeing.

I want to explain this in order that my readers will understand the situation. Colors dyed with Primuline or other substantive dyes, diazotized and developed; also colors afterchromed, did not need any aftertreatment to make them fast enough for scouring and fulling, and wool could be dyed with acid colors if the proper dyestuffs were used. This class of dyeing, consequently, was sold as fast colors and used for scouring and fulling, or for cross-dyeing, as desired. On the other hand, blue, green and purple colors were dyed with basic color and perhaps a bottom of direct color. As for bright green, if it was to be used in cloth made up of dyed yarn it needed no aftertreatment, the colors being fast enough for that.

I had learned in my visit to the woolen mills that my troubles for the greater part had been that my colors were too fast, and in order to obtain the right patterns the decorating silk was expected to lighten up a trifle in the fulling. I have already said that mine in some cases, like the blues, darkened instead.

Suiting Process to Requirements

Now, if they were to be used in cloth made up of gray wool and subsequently dyed, it would be necessary to aftertreat the colors, and this we did with tannic acid 10 per cent for one hour at the boil, then with tartar emetic 3 per cent at 140 deg. for half an hour. If for special purposes the colors were wanted resisted, then I treated the former colors also with this latter treatment, using a final bath made up of tin crystal 3 per cent, dissolved and clarified with muriatic acid at 120 deg. for half an hour. I knew what each mill wanted and acted accordingly.

But when I received my instructions for dyeing I noticed that they sometimes got their wires crossed and would write on my ticket "Resist" when I knew that cross-dyeing was what they wanted. I thought it was my duty to enlighten them and show them the difference so that they could write their tickets intelligently. Upon doing so I was very politely told that they did not care what I did to the colors; that I knew what was wanted and to use my own judgment. Well, I knew that as long as I stayed with the mill it would be all right; but what if I should take sick or die or leave them? They did not stop to consider those probabilities and, as it did not concern me personally, I ceased worrying.

I kept my customers well pleased with our work and built up a large trade. On many occasions the customers could not get enough silk from us and were forced to buy it in other mills and send it to us to be dyed. When a season's work was over and a new season started, with new shades and new patterns, some of the big mills that used our silk for decorating would send their chemists to me and together we would work out problems of treating the new shades for some desired result. Thus everything went smoothly.

After seven years of faithful work I thought I was worth more money to my employer than I was getting. But as I was made to understand that I had reached the highest pay they could afford to give, I decided to change. When I got an offer to come South they tried strongly to dissuade me from going, but they would not meet my terms.

"Dyer Wanted"

It did not turn out well for them. The first dyer who went to take my place was a good dyer, an old-timer who had held an executive position in Paterson, N. J., for a number of years. When, two months after I had left, I returned home to take my family South, I called on the superintendent, who was delighted to see me. We had a long chat over old times, and before I left he assured me that they were having a "tough time" looking for a man to put in my place. The present dyer would last no longer than a week.

They continued advertising for a dyer and tried quite a number—five, I believe—none of whom made good. How could they? When I started, their trade was small in that line and I was learning while I built it up. The new dyer went there to find a big trade already there, and therefore had to know his business well—which no doubt he did, or else he would not have attempted to take a job like that. But he probably did not know, as I did not know in the beginning, what the trade wanted; and, what was worse, the people who were supposed to give him the proper instructions did not know, because they had failed to heed my advice and learn the needs of the trade to whom they were selling, leaving that entirely to my judgment.

They finally found a man recommended to be a highly educated and trained chemist and dyer. I had heard something of him. He had worked for his father, who managed one of the biggest dye plants in New England. When the boy graduated from Yale his father had sent him to Leipzig, Germany, to another school of chemistry, and after that on a trip to visit all of the dyestuff factories in Germany. When he returned, he worked for five years in his father's dyehouse to absorb knowledge and practical experience. He got the job with my former employer at the beginning of the year. In the same year, on the 4th of July, I got a letter from the old superintendent. He said that the young man had failed to make good, and the firm, disgusted, had given up dyeing, selling their yarn in the gray, and had decided to use the dyehouse for storage, needing the room anyhow.

Now, it is my sincere wish that some or all of those dyers who went up there and failed should read this. It would surely do them good to find out that it was not altogether their fault that they did not succeed. When they received their dyeing instructions to make colors fast

(Concluded on page 108)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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DECEMBER MEETING OF THE RHODE ISLAND SECTION

The regular December meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held in the rooms of the Providence Engineering Society on Friday evening, December 18, 1925.

The meeting was called to order by Chairman Williams at 8.15.

Mr. Williams was the speaker of the evening, his subject being "Some Phases of the Manufacture and Use of Hydrogen Peroxide in the Textile Industry." His speech was illustrated with blackboard diagrams. At the conclusion of the address a period of discussion took place.

A rising vote of thanks was rendered to Mr. Williams. The meeting adjourned at 9.30. Thirty-three members were present.

Respectfully submitted,

ALBRO N. DANA, *Secretary.*

JANUARY MEETING OF THE RHODE ISLAND SECTION

The regular January meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held in the rooms of the Providence Engineering Society on Friday evening, January 22, 1926.

The meeting was called to order at 8 o'clock by Chairman Williams.

The Secretary's report of the December meeting was read and accepted.

The Nominating Committee renominated all of the officers that served last year, as follows: Chairman, Walter S. Williams; Secretary, Albro N. Dana; Treasurer, Ben Verity. Sectional Committee: Herbert F. Schwartz, Karl R. Moore, John S. Masson and William H. Wingate.

It was moved and seconded that one ballot be cast by the Chairman of the Nominating Committee re-electing the officers as nominated.

A very interesting talk regarding "Mildew" was given by Dr. Louis A. Matos, who was the speaker of the evening. At the conclusion of Dr. Matos' address a rising vote of thanks was extended to him by the thirty-one members present.

The meeting was preceded by a buffet supper, at which twenty-five members were present.

Respectfully submitted,

ALBRO N. DANA, *Secretary.*

COMMUNICATION

Professor L. A. Olney,
Lowell Textile School,
Lowell, Mass.

Dear Professor Olney:—Under the auspices of the National Research Council, working in co-operation with foreign learned societies, very exact critical data are being compiled for publication. The results of the work are to issue under the title of "International Critical Tables."

I was asked to act as contributing editor, taking as my subject the fastness of dyestuffs to light. After going through all the records that I could find I sent in a report which was entirely negative as far as the compilation of critical data was concerned. The editors decided not to publish this report because it was negative.

It has occurred to me that what I said in that report forms a very brief statement regarding the present status of the question of light fastness and may therefore be of interest to the members of the American Association of Textile Chemists and Colorists. I am therefore submitting it with the suggestion that it be published in the proceedings of the Society together with this letter to explain the nature of the report. I have thought it well not to amplify my statements because I think their very conciseness adds to their clarity.

Very truly yours,
(Signed) Dr. R. E. Rose.

The Fastness of Dyes to the Influence of Light

By Dr. R. E. Rose
E. I. du Pont de Nemours & Co.

The fastness of a dye to the influence of light may be defined as the degree of permanence of the optical properties of the dyeing or lake produced from it when exposed to the influence of radiant enegry under atmospheric conditions. By definition, then, fastness to light is not a precise transition point; it is only a convenient term to cover changes which are important because they influence the use made of the dye.

The following are the important variables which influence the fastness:

a. The composition of the dye.
b. The intensity of the dyeing.
c. The quantity of the radiation.
d. The wave length of the radiation.
e. The quality of the substrate.
f. Temperature.
g. Humidity.

Because these variables have not been exactly controlled it is impossible to correlate the data obtained by different experimenters in this field, but the fact should be noticed at once that this does not mean that the results of each investigator are unreliable or that they are insufficient for the needs of those who use the tests.

To take the variables in detail:

(A) Commercial dyes are almost always mixtures, either owing to the process of manufacture which results in the formation of a number of products, or by reason of the standardizing which the manufacturer is compelled to employ in order to even the variations in the quality of the crude color resulting from the plant process. In addition to this variation in composition it should be remembered that when a dye is converted into a lake, for instance by chroming, that the composition of this lake is very important to the fastness of the dyeing.

If exactly comparable results are to be had by different experiment, pure dyes of known composition, applied by standard methods should be used. (Note that this requirement rules out all sulphur colors, a very important class of unknown and variable composition.)

(B) The effect of light is primarily topochemical, therefore the intensity of a dyeing or the thickness of the layer exposed will alter the fastness very considerably.

(C) Sunlight is a variable quantity and it should be better defined than by the mere statement that exposures were made at a certain time of the year, for a certain number of hours, in a certain latitude. In this connection, it seems very probable that the barium cell manufactured by the Case Research Laboratory will prove useful although its calibration in terms of fading has not gone far enough to determine whether it records variations in the wave lengths which are responsible for fading with sufficient precision. Certainly it would seem better than anything previously used for this purpose.

(D) Because of the varying nature of the absorption of light taking place in the atmosphere, radiation is qualitatively variable, a fact which should be taken into account if comparable results are to be obtained.

(E) Temperature is an important factor in fading. By its very nature sunlight falling upon a dyed fabric exposed upon a backing of cardboard will cause very appreciable temperature changes and these should be measured by different workers if their results are to be comparable.

(F) In the case of lakes, the inert material upon which the dyes are precipitated influences the fastness of the color to light very materially. In all probability such effects in the case of different grades of cotton are too small to vitiate results and the same is true of wool and silk, but in any case it would seem preferable to standardize the substrate upon which tests are carried out.

(G) The data already collected show that humidity plays an important part in the processes which cause the destruction of the color. It should be recorded.

In addition to these variables there is another one, arising out of the nature of the change, which makes the interpretation of results as between two investiga-

tors almost impossible except qualitatively. Fading is a composite of change in hue, change in brightness and change in strength. These changes may all be present, as is usual, but sometimes only two are evident, or even one alone. There is no absolute scale upon which these changes can be recorded because the judgment of the extent of fading is an expression of the opinion of the observer; there being as yet no quantitative method of comparing changes of "strength" in different fields of the spectrum. Moreover, it should be remembered that the importance of fading is the outcome of its effect on the eye of the consumer, and it is for this reason that the dyer may judge a red which fades to blue as being less fast than a red fading to yellow because the former would alter component shades in which it was used more than the latter, as judged by the eye, though actually, if quantitative measurements were made, it might be shown that the two reds were equally fast.

Again, the fastness of the two yellows might stand to each other as do those of Chrysophenine and Indanthrene Yellow. The latter is absolutely much faster than the former, but in comparison to the other dyestuffs with which it is used and against which it must be judged, that is, the vat dyes derived from anthraquinone, it is comparatively fugitive while Chrysophenine is relatively very fast to light for a direct azo color, hence the dyer classes Chrysophenine as fast, Indanthrene Yellow as fugitive. It is facts such as these that make a table including all dyestuffs quite useless from any practical point of view.

Finally, the present status of work on the fastness to light does not allow of any standard change being adopted as a transition point. For instance, some take a change that is perceptible to the eye as a final point; others the time required for fading the shade one-half; and yet others the time taken to destroy the shade entirely. It frequently happens that a dyeing of one color changes in hue during the first few hours of exposure, but then remains unchanged for a much longer period than that of another dye which does not change during the first hours. Which one is faster? The answer is a matter of convenience and not a scientific definition.

Comparative tests are so easily made by exposing two samples under the same conditions that it would seem unnecessary to endeavor to refine the methods at present in use for testing the fastness to light of dyes.

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Resignations

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Moss, C. E., 2031 Walnut Street, Philadelphia, Pa.

St. John, Sylvester L., Garnerville, N. Y.

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

WALTER E. HADLEY,
5 Mountain Avenue,
Maplewood, N. J.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
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INCONSISTENT EFFICIENCY—A STORY FOR RAYON MANUFACTURERS

WHEN a laboratory is set up in the textile mill there is at first usually more than a little discussion of its value from the standpoint of efficiency in mill operation. Much is said at the time of the obvious advantages in having a department where all sorts and conditions of things can be examined, tested, analyzed and stamped as suitable with the seal of irrefutable authority.

But very soon the mill's attitude toward its laboratory becomes strangely inconsistent with its original deep respect for the word of the man who juggles solutions, retorts and test tubes. A thousand and one petty problems are delegated to the presiding genius of the "lab," but in really important cases where a chemist *ought* to be consulted the decisions are made by a totally incapable judgment, a judgment devoid of the essential technical knowledge and easily swayed by what it vainly regards as "cold logic."

In making this indictment against those in charge of mill managements we have in mind, as an example, the prevalent practice of selecting rayon by the highly scientific method of rubbing a sample between thumb and finger and admiring its glistening surface in the light of the lamp on the desk. That this is done we know from a recent enlightening survey made among dyers, mill chemists and superintendents.

When a purchase of supplies in the mill involves a few dollars' worth of soap, the man in the "lab" is at once called in to pass judgment upon a half dozen samples of competing products. But when the purchase involves an order for rayon running into thousands of dollars the scientist in the swivel chair performs his own little tests and arrives at his selection by a simple reasoning process, by a simple side-by-side comparison of three or four brands. The dyer who will ultimately receive the rayon, the chemist who will ultimately be called upon to work out new dyeing formulas for it, are simply not considered at the time the order is signed. The utter simplicity of the entire proceeding is not revealed in its full significance, however, until the dyehouse superintendent reports trouble "with that last lot of art silk."

"In that case," the superintendent is assured, "we shall take a shot at so-in-so's," and the shot is taken. The new lot dyes perfectly with wool but somehow it will not work with silk. This report issues from the dyehouse after the fourth brand of rayon has been tried. And still the experimenting continues and costs mount, while the man in the "lab" idly twiddles a few c.c.'s of acetic acid in a test tube and works out the viscosity of a new lot of typewriter oil and the dyer mutters something frightfully profane as he surveys with one eye another spoiled order from the best customer on the list.

When will rayon manufacturers begin to fight their turned-down orders with an educational campaign having as its keynote an appeal to all dyers and chemists to claim the right to test every new lot of rayon purchased by the mill? Until some move in this direction is made no brand of rayon can successfully establish itself in the market purely on the merits of its individual dyeing properties. Whenever wasteful experimenting and empirical practice supplant technical judgment in buying a product like rayon, that product's hard-won reputation hangs by the slender thread of a transient buying impulse. To buy or not to buy is then a question that concerns itself with price and with the outward appearance of the product, not with its intrinsic values. Can any product judged by the light of passing fancy win permanent recognition over an inferior competitor?

LEADERS MUST LEAD

A WRITER in a current issue of the Manchester Guardian discusses some of the principal economic aspects of operating a dyestuff factory. In explaining this somewhat abstruse subect to his readers, who are, we may presume from the tone of the article, average business men with little or no technical training, this writer has crystallized into a single brief paragraph the one supreme principle upon which all dyestuff industries, in fact, all industries, are erected. After stating that the economic problem of the dyestuff industry is to see that plant and intermediate capacity are used to the full and that no waste occurs in overproduction, he says:

> Even this envisages the dyestuff factory as a static entity, making colors and chemicals for which there is a known market demand and by technical methods perfectly known. But the dyestuff factory, if it is to progress or even to exist, must be kinetic. New and improved colors must be sought for and introduced, and a commercial and technical routine is no sooner introduced than it must be considerably modified to meet chang-

ing market demands or to allow of the production of new or improved products.

Before bringing out the main thought of this editorial we shall draw upon another quotation, this time two sentences from a recent financial review which sum up in a trenchant phrase the same idea:

> Leaders must lead, or surrender their places to those better fitted to occupy them. And the leaders must always be those who are willing and able to employ new knowledge, new methods and new economies of every kind to the best advantage.

To take on the new, we must first abolish the old, is a truism that might fittingly close either of these quotations. Now, at the beginning of a new period of prosperity in all industry in general, with a record year behind us and a future that promises above everything else business stability and continued progress, it is decidedly an opportune time for dyestuff factories to turn a critical eye upon the methods and the equipment that have carried them thus far. Old ideas are tenacious. Tradition clings like moss to business and innovations win their places only after tremendous opposition from the venerable practices of the past.

But "leaders must lead" and only by enlarging the scrap pile in the yard can new methods and new economies be instituted. An inventory made at this time of all equipment to be scrapped, of all methods crying for drastic revision, of all old practices that have outgrown their excuse for existing, cluttering the way of leadership, defying progressive measures, will push any business years ahead of the competitor who smugly prates of letting well enough alone. Old methods, old equipment, constitute the *dust* in industry and there is no better time than the present to set aside an industrial clean-up week.

CALCO ABSORBS KERIN MFG. COMPANY

Under date of February 1 the Kerin Manufacturing Company, of Marietta, Ohio, and the Calco Chemical Company simultaneously announced to the trade the purchase of the business and good-will of the former by the latter.

The Kerin Manufacturing Company has for several years produced a very excellent line of basic colors, which have been distributed through the Marietta Refining Company, and Calco also has been a large producer of these colors.

The absorption of the smaller manufacturer by Calco is in line with the policy which The Reporter has so repeatedly advocated in its editorial columns as the obvious means for remedying the impossible competitive conditions which exist in the American dyestuff manufacturing industry. We sincerely trust that this step may be emulated by other manufacturers. There can be no question but that the cutthroat competition of to-day can be materially lessened by decreasing the number of factors which are in open competition with each other. There are so many obvious economies to be effected by such a procedure that it is difficult for us to understand why consolidations of this type are not more numerous.

The statements to the trade emanating from both Calco and Kerin are as follows:

Marietta, Ohio, Feb. 1, 1926.

For the past four years we have manufactured and supplied to the trade a number of basic dyestuffs, chief among which were Auramine, Malachite Green and Brilliant Green. That our efforts in this direction were constructive and successful is attested by the very cordial relations that have existed between ourselves and our customers. For some time, however, we have realized that we should greatly increase our manufacturing facilities and make a larger number of products in order to realize the maximum efficiencies in operation, exert better control over our raw materials and gain a more complete distribution of essential overhead expenses.

In lieu of adopting a program involving this expansion, we decided to turn our business over to one of the larger manufacturers having already in existence these larger and better facilities, and we have selected the Calco Chemical Company, of Bound Brook, N. J., themselves large manufacturers of basic colors, as the concern best fitted to carry on to completion the work we have started. It gives us great pleasure, therefore, to announce to our friends and customers throughout the trade that we have completed an arrangement whereby the Calco Chemical Company has taken over our entire manufacturing equipment as well as our business and good-will.

Calco will continue at its Bound Brook, N. J., plant the manufacture of the products which we have been making at Marietta, and all orders and communications should hereafter be sent to the Calco Chemical Company, Bound Brook, N. J., or to one of their several branches as they may indicate.

It is our firm conviction that Calco is most unusually well fitted to maintain and improve our various standards and that they will serve you to excellent advantage. We bespeak for them your continued co-operation and support.

The Kerin Manufacturing Company.

Bound Brook, N. J., Feb. 1, 1926.

We have purchased the business, good-will and entire manufacturing equipment of the Kerin Manufacturing Company, of Marietta, Ohio, and wish to now advise both their customers and ours that the products which they have been making—namely, Auramine and other basic colors—and which they have distributed through the Marietta Refining Company, will hereafter be manufactured in our Bound Brook plant and will be distributed from stocks here as well as from our several branches.

We shall highly appreciate your business on these products and shall devote to same our very best attention.

The Calco Chemical Company.

MEN OF MARK

in the field of dyes and their application

AXEL J. JORGENSEN

Superintendent of
Dyeing, Bleaching and Finishing
Bibb Manufacturing Co.
Macon, Ga.

AXEL J. JORGENSEN was born in Copenhagen, Denmark, September 5, 1868. He was educated at Wolfsen Institute, Copenhagen, and later graduated from Copenhagen University.

After spending several years in Germany and Austria acquiring a knowledge of European methods of textile processing, he came to the United States late in the last century and, after holding various textile-chemical positions in this country, entered the employment of the Bibb Manufacturing Company, Macon, Ga., in February, 1900, as Assistant Superintendent of Dyeing. In April, 1902, he was made Superintendent of Dyeing, Bleaching and Finishing for this same company, which position he still holds.

During his more than twenty-five years of uninterrupted service with the Bibb Manufacturing Company he has witnessed the expansion of this concern from a group of four to a group of eleven mills. During the month of January, 1925, which celebrated his twenty-fifth anniversary with this company, his department set a production record, showing an increase of 138 per cent over the total production in the same month twenty-five years previous and an increase of 19 per cent above the highest production mark ever reached during the period of the World War.

Mr. Jorgensen is very widely known throughout textile and dyestuff circles in the South, and is generally regarded as one of the most progressive and competent men in his chosen field.

A Description and Use of Cruger's Micro-Analyser

For the Analysis of Textiles, Their Fibers and Construction

THE analysis of textiles as to their fibers and construction has always been tedious work, even under the most favorable conditions.

The operator in the case of woven fabrics has had to rely upon two forms of magnifiers: the small pocket pick glass, or else those of the simple microscope types. In either case the results have been far from satisfactory. The small folding glasses allow of but limited vision at extremely close range, with distorted focus at either edge of the lens. In other types the view is slightly improved, but is far from accurate or satisfactory.

With the existing glasses the operator is dependent upon daylight, and where this is not readily obtained, due to conditions, he is forced, naturally, to use artificial light. If this light comes from an overhead source his head casts a shadow upon his work, while from a table lamp the reflection is usually cast in his eyes.

In "picking out" a weave with the small glasses he is limited to a very small surface in one direction, with a possibility of shifting his glass or sample, thereby throwing out the calculation. Other types, as a general rule, are not adapted to this purpose at all.

Bearing all these difficulties in mind, Cruger's Micro-Analyser was devised in an effort to furnish an instrument that the technician in his work would find at once simple, reliable and, above all, accurate under any condition.

Description of Parts

By referring to Fig. 1 we find the following general parts:

An illuminator box housing the source of illumination which reflects light through the glass screens "A" and "B." These are made of high-grade flash opal glass giving equal diffusion. The metal hood "C" can be raised so as to furnish full light through the screen "B" or else closed down partly or completely, thereby controlling the light from this source.

A diaphragm "E" of special construction, having apertures which are readily controlled as to size, fits over screen "A" and is used where the object to be examined is smaller than the screen, and where no light is desired through screen "A." The spring metal clips "8" serve to hold the diaphragm and sample firmly in place.

A Leitz binocular microscope is mounted upon a carriage which is moved from side to side by the screw-head "2" and forward and backward by the screw-head "1." Micrometer movement is obtained by rack and pinion, giving the carriage or microscope respectively an accurate and uniform movement. The screw-head "3" serves as focus to the microscope.

The scales "7" and "7'" allow direct reading and by means of their stop device serve as guide for the distance the microscope is to travel. The set-screws "6" and "6'" lock these scales in place. The scales are furnished in different calibrations to permit reading in lignes, millimeters and inches, as may be desired.

Features of Leitz Binocular Microscope

It is only too well known that the ordinary simple monocular microscope, having short working distance and limited field of view, does not give the necessary magnification or range of vision required. Compound monocular microscopes, although of high efficiency and accuracy, give inverted images of small field of view, making it difficult for those not versed in microscopy to use them satisfactorily. Eye strain, ever present in monocular microscopes, made this type still more objectionable. The Leitz Binocular Microscope, Model BSMC, was therefore selected as being best adapted for this purpose.

This microscope offers a magnification sufficient for the work, and at the same time renders an exceedingly large field of view without distortion at the edges. The image is erect, exceedingly lively, clear and sharp, and appears in surprisingly plastic relief without tiring the eyes even after prolonged use. Unlike other types of compound magnifiers, the image is not reversed, making it simple to follow the work laid out.

The free working distance is approximately 18 mm., thereby further reducing eye strain and making simple the use of the pick needle without obstruction. The field of view is about 10 to 15 mm. in diameter, offering sufficient area for all work.

The interpupillary distance between the eyes may be varied at will according to the width of the operator's eyes by merely spreading or closing the distance between the tubes. The oculars are so equipped that one is stationary and the other in adjustable mounting to permit correction according to the refractive index between the operator's eyes.

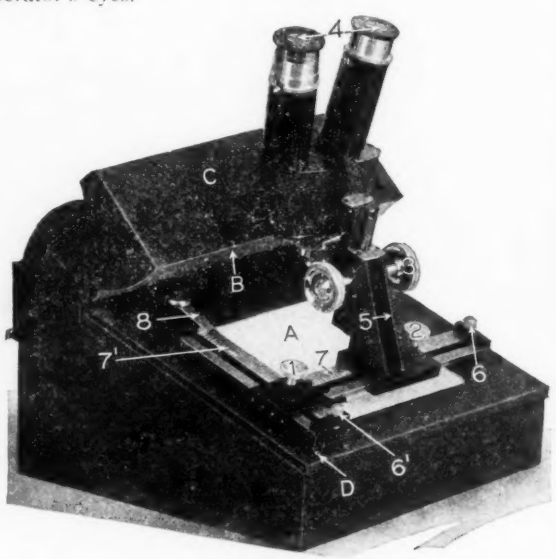


Fig. 1—*Cruger's Micro-Analyser*

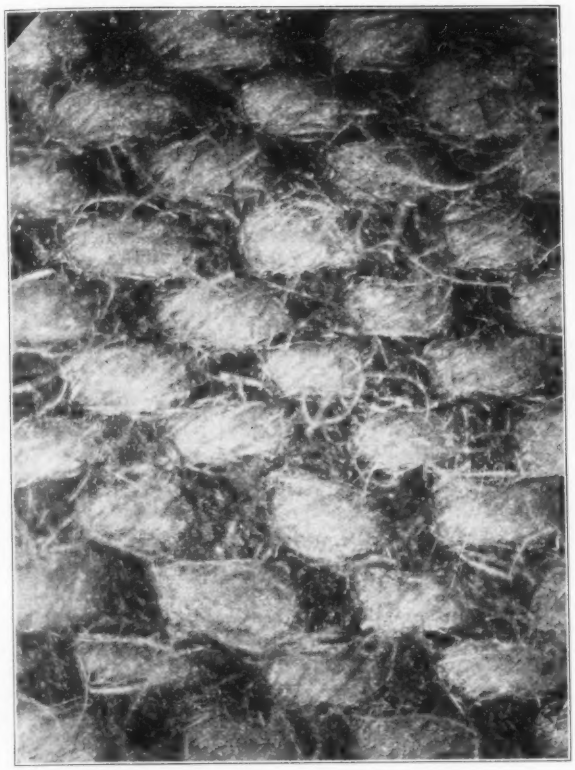


FIG. 2—*A Sample of Wool Suiting*

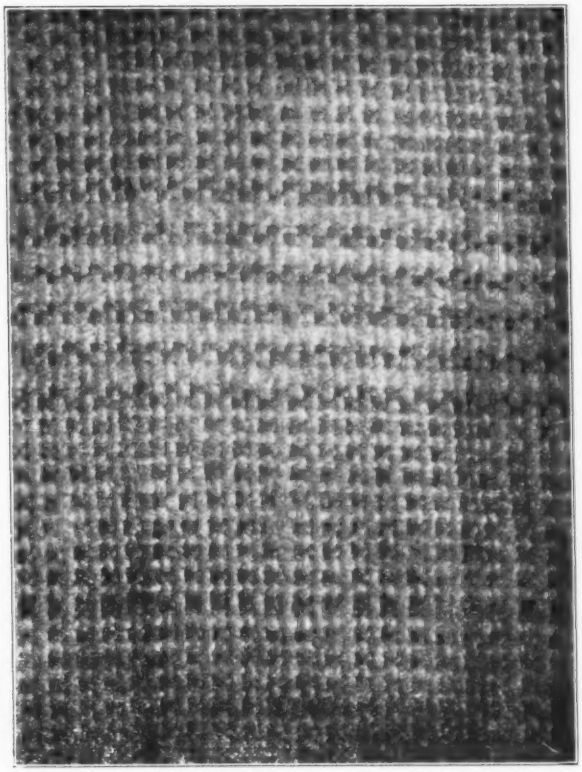


FIG. 3—*A Sample of Jacquard Cotton Shirting*

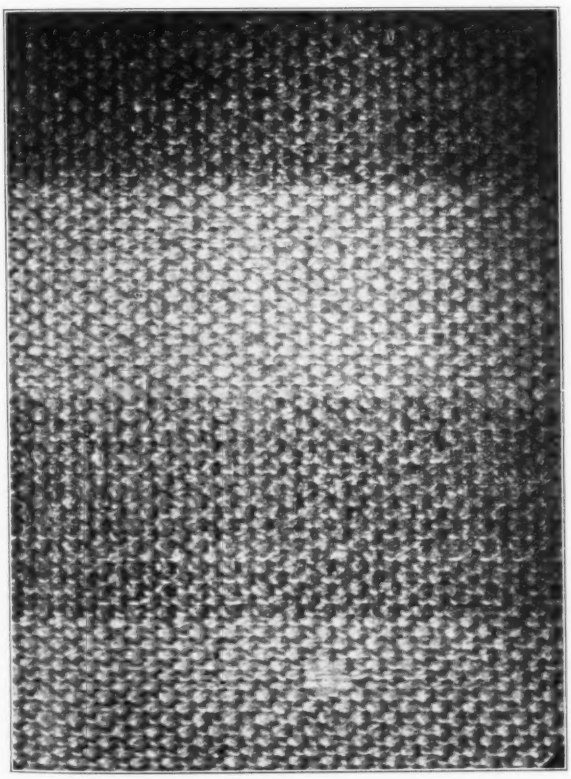


FIG. 4—*A Sample of Fancy Striped Tub Silk*

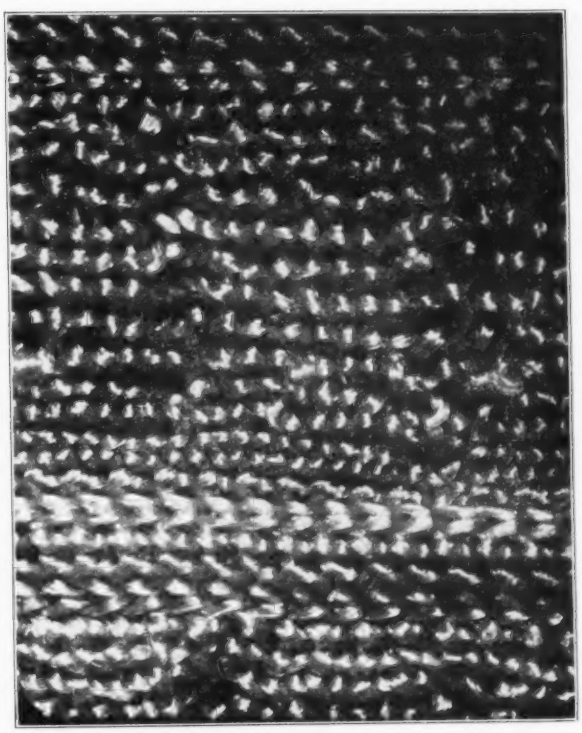


FIG. 5—*A Sample of Knitted Rayon Tricollette*

FIG. 6—*A Sample of Fine Worsted Suiting*

The dovetail construction of the focusing adjustment attached to the prism body of the microscope makes it possible to readily remove the microscope from its carriage and by use of an auxiliary stand the microscope is ready for use at the examining table, on standard forms of twist counters or elsewhere, as the operator desires.

METHOD OF OPERATION: TRANSPARENT OBJECTS

The method of operation is very simple. The sample to be examined is placed upon the screen "A" and covered with the diaphragm "E," using an opening of convenient size. It is then clamped in place by means of the clips "8" which hold the diaphragm and sample in place. (In order to have ready access to the sample support "A," the entire carriage holding the microscope may be tipped upward from right to left. This is readily done, since the carriage is mounted on a pivot "D.") The hood "C" is closed and the light switched on. The microscope is now oriented relative to the sample in manipulating the rack and pinion movements by means of the screw-heads "1" and "2," and focused by raising or lowering it to the proper distance.

The photographs Figs. 2 to 5 are reproduced images of textiles viewed under these conditions. (These photographs are reproduced about the actual size seen by the eye at the microscope.)

If it is desired to intensify the view, hood "C" is raised to the angle required, when light will be reflected downwardly upon the surface of the fabric. In this condition, it will be noted, each fiber assumes its normal form and is readily recognized.

In order to count the threads in the warp, the microscope is brought to the starting point and focused upon the fabric, using the needle pointer seen in the eyepiece as an indicator. Assuming that it is desired to cover an inch of surface, the scale is drawn out so that the first marking coincides with the edge of the microscope carriage, and is then fastened in place by turning the set-screw "6." (This distance, of course, may be changed at will.) The carriage is then propelled to the left, and when the entire inch has been covered is automatically stopped by the metal rest at the end of the scale slide. During the time that the microscope carriage travels, the operator follows thread by thread as each is passed by the needle pointer. The accuracy of this system will be readily noted, since it is impossible to cover more than the space wanted. If the operator desires to check his work he moves the microscope down or over a few picks or ends, as the case may be, and repeats his operation.

In order to count the opposite of the weave, the same operation takes place, using the scale and slider at the left without changing the position of the sample or microscope.

The accurate control of lighting, distance to be trav-

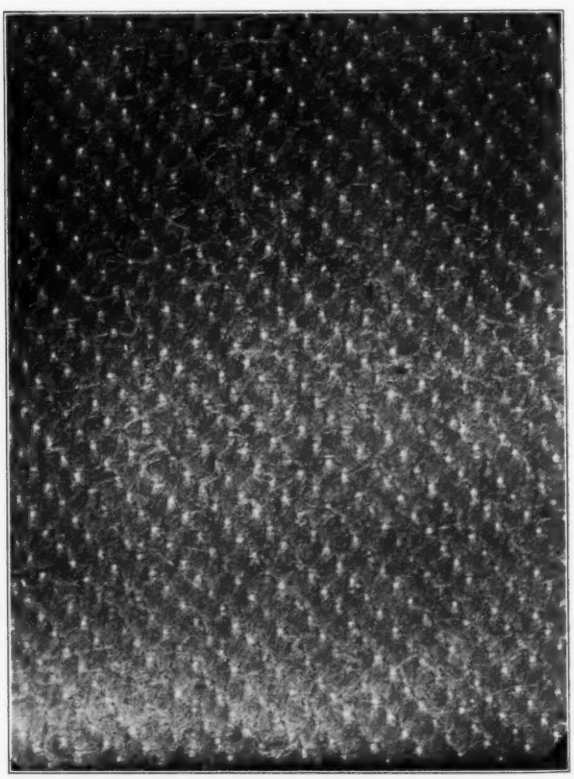


FIG. 7—*A Sample Showing the Back of a Cotton-Back Satin*

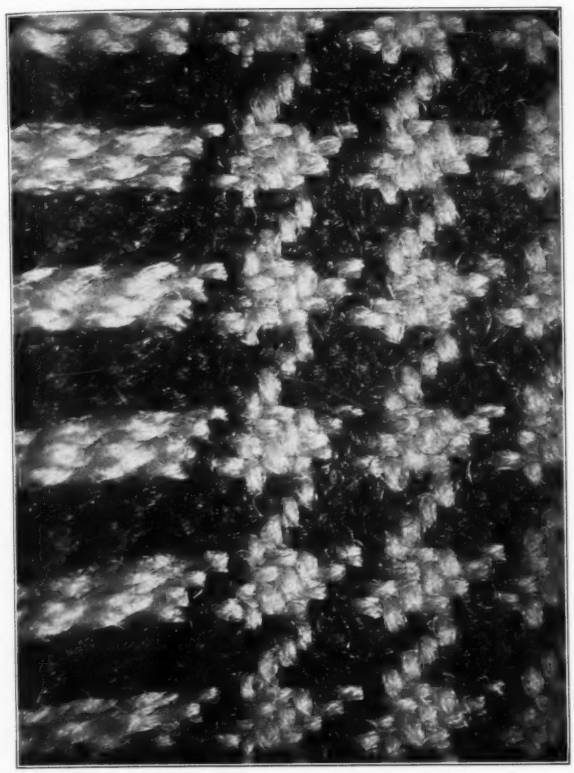


FIG. 8—*A Sample of Worsted Suiting Picked Out for Analysis*

eld and ease of operation in all directions will be brought to mind very clearly from the foregoing.

METHOD OF OPERATION: OPAQUE OBJECTS

Opaque objects are handled in the same manner as described for transparent samples, except that the light through screen "A" is entirely closed out, using the solid plate in the diaphragm with the sample placed upon it. The hood "C" is then raised to the required position, throwing an intense light downwardly upon the sample.

The photographs Figs. 6 to 7 are reproduced images of textiles viewed under these conditions.

For. Figs. 8 and 9 light from both sources has been used, a clear-cut image of both warp and filling making the operation simple in the extreme.

From the foregoing it will be seen that the time of an analysis will be materially lessened, with a resultant increase in the operator's efficiency.

Many other purposes will present themselves to the operator, such as the examination of fibers for uniformity and regularity in twist, examination of raw and dyed fibers for lousiness, examination of defects in construction, as well as pattern calculation and tracing.

The foregoing description given of Cruger's Micro-Analyser should prove convincing that it represents an instrument simple to manipulate while accurate under all conditions. For the purpose intended it has no equal, and it therefore may be safely assumed that it will command a far-reaching recognition.

KNIT GOODS MEETINGS TO BE HELD IN EXHIBITION BUILDING

All the meetings and the luncheon of the convention of the National Association of Hosiery and Underwear Manufacturers, to be held in connection with the Twenty-second Annual Knitting Arts Exhibition, will be in Commercial Museum, where the exhibition will be held from March 22 to 26, according to an announcement just made by John Nash McCullaugh, the manager of the National Association of Hosiery and Underwear Manufacturers.

Some little criticism has arisen in the past years, among both exhibitors and visitors to the show, that at the most important part of the day all members of the association were called upon to leave the exhibition hall to attend the meetings. The scene of the meetings being a considerable distance from the location of the exhibits meant that the better part of the day had elapsed before their return.

Under this new arrangement the thousands of buyers from all parts of the United States and Canada who are members of the association under whose auspices the exhibition is held, can give their full attention to the doings of the convention and at the same time have full time to thoroughly inspect all displays.

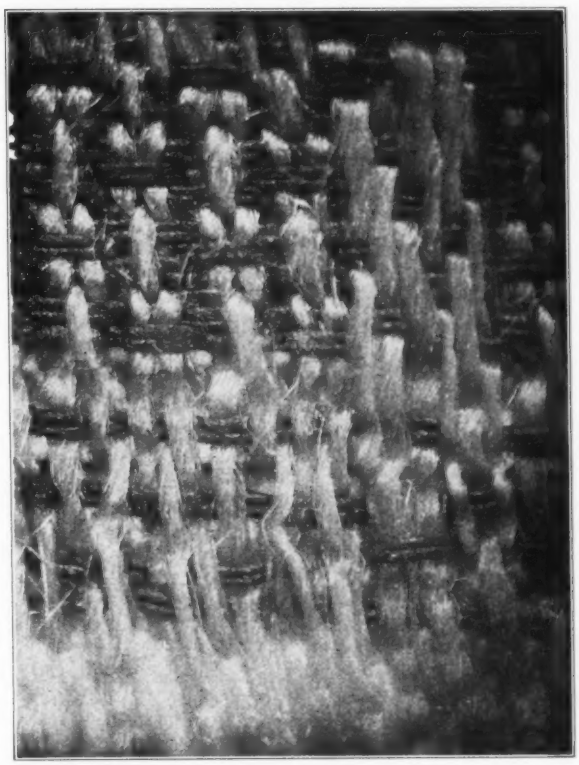


FIG. 9—*A Sample of Mohair Coating Picked Out for Analysis*

The Reduction Products of Azo Dyes

Part VIII

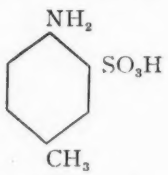
By WALTER C. HOLMES

Color Laboratory, Bureau of Chemistry

[EDITOR'S NOTE.—*The most practical and effective method for the identification of azo dyes consists in the isolation and identification of the products which they yield on reduction. This method finds less application than it might or should, partly because some of these products have never been isolated and investigated, and partly because much of the data which has been obtained in regard to such reduction products is greatly scattered and very difficult to locate.*

Mr. Holmes has made a search for all the available information on such reduction products, and this series contains a digest of his results with a systematic listing of the reduction products of the azo dyes published in the Colour Index, together with the available data on such properties and reactions as would be of service in their identification.]

No. 79.—4-TOLUIDINE-3-SULFONIC ACID (m-sulfo-p-toluidine)



$C_7H_9NO_3S$; Mol. Wt. 187.18; (C, 44.9%; H, 4.8%; N, 7.5%; O, 25.6%; S, 17.1%).

Derived from C. I. No. 163.

Yellow needles ($+\frac{1}{2}H_2O$), sol. in 10 pts. cold H_2O. Unlike the o-sulfo isomer it is sol. in alc. Its Pb salt is much less sol. in H_2O than that of the o-sulfo isomer. Its K salt is insol. in cold KOH sol., whereas the K salt of the o-sulfo isomer is sol.

Cold aq. sols. are colored wine-red by a little PbO_2 and wine-yellow by $FeCl_3$, turning redder on warming. It reduces ammon. Ag. sols. Aq. sols. heated to 180° yield p-toluidine. On fusion with alkalies it yields p-oxybenzoic acid.

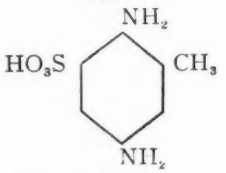
No. 80.—o-AMINO-p-CRESOL SULFONIC ACID

$C_7H_9NO_4S$; Mol. Wt. 203.18; (C, 41.4%; H, 4.5%; N. 6.9%; O, 31.5%; S, 15.8%).

Derived from C. I. No. 173.

The constitution of C. I. No. 173 is not fully established. The reduction product would probably be 3-amino-4-cresol-5-sulfonic acid or 3-amino-4-cresol-6-sulfonic acid. Both give yellow diazo compounds, that of the latter being less sol. in H_2O. They could probably be distinguished by conversion into characteristic pyrazolon dyes. (See Conn, "Die Pyrazolfarbstoffe.")

No. 81.—2, 5-DIAMINOTOLUOL-3-SULFONIC ACID

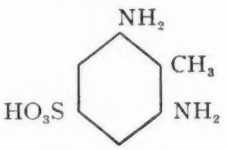


$C_7H_{10}N_2O_3S$; Mol. Wt. 202.19; (C, 41.6%; H, 5.0%; N, 13.9%; O, 23.7%; S, 15,9%).

Derived from C. I. No. 18.

Apparently no data are available on this compound.

No. 82.—2, 6-DIAMINOTOLUOL-4-SULFONIC ACID



$C_7H_{10}N_2O_3S$; Mol. Wt. 209.19; (C, 41.6%; H, 5.0%; N, 13.9%; O, 23.7%; S, 15.9%).

Derived from C. I. Nos. 233 to 235 and 609.

White rhombic prisms which turn gray easily in air and do not melt up to 280°. Sol. in 1,470 pts. H_2O at 14°, insol. in alc.

Hydrochloride ($+2H_2O$), small, colorless, rhombic prisms which are readily sol. in H_2O (with partial loss of acid.

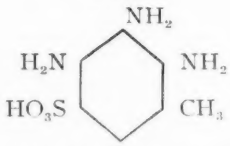
The hydrochloride gives a tetrazo comp. with nitrite sols. when cooled with ice but forms an analog of Bismarck Brown at ordinary temps.

Two mol. of the acid coupled with diazotized o-tolidine give an orange dye which turns violet with dilute acids.

The diazo comp. of the monobrom deriv. of the acid cryst. in thin, pale yellow, long plates ($+2\frac{1}{2}H_2O$), almost insol. in alc., easily sol. in H_2O, colored dark blue by heating over 100°.

(For azo deriv. see Friedl. II, 369; III, 741; IV, 992)

No. 83.—2, 3,4-TRIAMINOTOLUOL-5-SULFONIC ACID

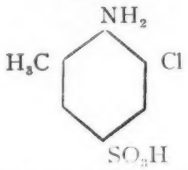


$C_7H_{11}N_3O_3S$, Mol. Wt. 217.21; (C, 38.7%; H, 5.1%; N, 19.3%; O, 22.1%; S, 14.8%).

Derived from C. I. Nos. 446 and 478.

Apparently no data are available on this compound.

No. 84.—3-CHLOR-2-TOLUIDINE-5-SULFONIC ACID



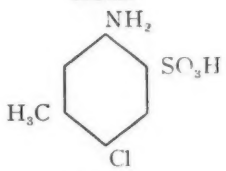
$C_7H_8ClNO_3S$; Mol. Wt. 221.63; (C, 37.9%; H, 3.6%; Cl, 16.0%; N, 6.3%; O, 21.7%; S, 14.5%).

Derived from C. I. No. 643.

Needles, readily sol. in hot H_2O. The diazo comp. is also readily sol.

By heating with 75% H_2SO_4 at 150-60° the sulfonic grp. is split off, forming *3-chlor-2-aminotoluol*.

No. 85.—3-CHLOR-3-TOLUIDINE-4-SULFONIC ACID



$C_7H_8ClNO_3S$; Mol. Wt. 221.63; (C, 37.9%; H, 3.6%; Cl, 16.0%; N, 6.3%; O, 21.7%; S, 14.5%).

Derived from C. I. Nos. 165 and 166.

White pdr. or thin, colorless, anhydrous plates which readily turn red in light and air. Rather difficultly sol. in H_2O.

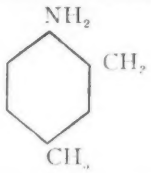
Sols. in sod. acetate are colored brown by $FeCl_3$.

The diazo deriv is almost colorless and is only moderately sol.

Aq. sols. of the acid decolorize bromine water instantly even in the cold, giving *6-chlor-2, 4-dibrom-m-toluidine*, long, colorless needles, mpt. 99.5°, sol. in hot alc.

By heating the acid with 75% H_2SO_4 *2-chlor-5-toluidine* is obtained, cryst., mpt. 83°, bpt. 241°. The nitrate of the later comp. melts at 165° (decomp.); 100 pts H_2O dissolve 5.014 pts. nitrate at 17°.

No. 86.—m-XYLIDINE



$C_8H_{11}N$; Mol. Wt. 121.14; (C, 79.3%; H, 9.2%; N, 11.5%).

Derived from C. I. Nos. 73 to 79, 234, 263 and 264.

Colorless oil, bpt. 212°. D = .9184 at 15°. Volatile with steam.

Acetyl deriv.; mpt. 129°, bpt. 170° at 10 mm.; *isonitroso acetyl* deriv.; mpt. 161°.

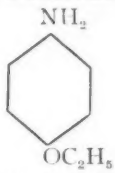
Hexabromoplatinate, yellow-red needles, mpt. 256°; *benzene-sulfonate*, mpt. 233°, 100 gm. aq sol. dissolve 1.46 gm. salt at 15°; *α-naphthalenesulfonate*, mpt. 167°, 100 gm. aq. sol. contain 1.2 gm. salt at 15°; *β-naphthalenesulfonate*, mpt. 211°, 100 gm. aq. sol. contain .27 gm. salt at 10°; *2, 7-naphthalene-disulfonate*, mpt. 292-3°, sol. in 100 pts. H_2O at 15°; *2, 6-naphthalene-disulfonate*, mpt. >360°; 100 gm. aq. sol. contain .35 gm. salt at 15°.

Additive comp. with: *sym. trinitrobenzol*, brownish-red cryst., mpt. 96-8°; *sym. trinitrotoluol*, red needles, mpt. 43-5°; *sym. trinitroethylbenzol*, glittering red prisms (alc.), mpt. 52°.

Condens. prod. with: *benzenesulfonylchloride*, benzolsulfo-m-xylidine, cryst., mpt. 130-1°, sol. in alkalies (or the dibenzolsulfo deriv., needles, mpt. 140°, insol. in alkalies); *bornylchloride*, bornyl-m-xylidine, large needles (methyl alc.), mpt. 79°; *tetryl*, 2, 4, 6-trinitrophenyl-m-xylidine, orange-yellow needles, mpt. 157°; *sym. trinitrobenzaldehyde*, 2, 4, 6-trinitrobenzal-m-xylidine, mpt. 203°.

Diazotized and coupled with: *β-naphthol*, red needles (toluene), mpt. 166°, wine-red sol. in H_2SO_4, light-red pptte. on dil.; *Naphthol AS*, crimson, feathery needles (toluene), mpt. 220°, deep-red sol. in H_2SO_4, red pptte. on dil.

No. 87.—p-PHENETIDINE



$C_8H_{11}NO$; Mol. Wt. 137.14; (C, 70.0%; H, 8.1% N, 10.2%; O, 11.7%).

Derived from C. I. Nos. 122, 365, 377, 382, 459, 488, 527, 627 and 631.

Liquid. Mpt. 2.4° (cor.), bpt. 254.2-.7° (cor.). D = 1.0613 at 15°.

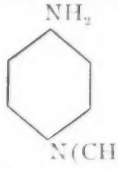
Hydrochloride, glittering, iridescent, rhombic plates, mpt. 234°, sublimes in long spears, readily sol. in H_2O, sols. colored red by $FeCl_3$ or bleaching pdr.; *citrate*, prisms, mpt. 186°; *acid citrate*, white cryst., mpt. 150°; *benzenesulfonate*, mpt. 171°, 21 gm. salt in 100 gm. aq. sol. at 17°; *α-naphthalenesulfonate*, mpt. 201-2°, 100 gm. aq. sol. contain .19 gm. salt at 15°; *β-naphthalenesulfonate*, mpt. 207°, 100 gm. aq. sol. contain .20 gm. salt at 15°; *2, 6-naphthalenedisulfonate*, mpt. >300° (decomp.), 100 gm. aq. sol. contain .13 gm. salt at 15°; *2, 7-naphthalenedisulfonate*, mpt. 230°, readily sol.

Formyl deriv.: leaflets, mpt. 69°, diffic. sol. in cold H_2O, readily in hot; *acetyl deriv.* (phenacetin): white leaflets, mpt. 134-5°, sol. in 70 pts. boiling H_2O; *diacetyl deriv.:* needles (ligroin) mpt. 53.5-54°, bpt. 182° at 12 mm., sol. in about 400 pts. H_2O at room temp.

Condens. prod. with: *p-bromobenzenesulfonyl chloride*, cryst., mpt. 143°; *sym. trinitrobenzaldehyde*, cryst. (alc.) mpt. 177°.

Diazotized and coupled with: *β-naphthol*, red-needles (toluene), mpt. 140°, red sol. in H_2SO_4, orange-red pptte. on dil.; *Naphthol AS*, dark-red plates (toluene), mpt. 218°, blue sol. in H_2SO_4, light-red pptte. on dil.

No. 88.—DIMETHYL-p-PHENYLENEDIAMINE (p-Aminodimethylaniline)



$C_8H_{12}N_2$; Mol. Wt. 135.14; (C, 71.1%; H, 8.2%; N, 20.7%).

Derived from C. I. Nos. 19, 58, 59, 133, 142, 211 and 265.

Long needles, mpt. 41°, bpt. 262.3° (cor.). D =

(*Continued on page* 108)

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

DIRECT BRONZE 2G

(Schultz No. 446)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Dyes by all methods suitable for direct colors.

SHADE: Bluish olive, duller than S-474.

SHADE BY GASLIGHT. Slightly darker.

SOLUBILITY: Good.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Destroyed.
Alkali: Fast.
Chlorine: Destroyed.
Ironing: Fast.
Light: Fairly good.
Rubbing: Fast.
Washing: Moderate, like other benzidine derivatives.

OTHER PROPERTIES: Suitable for pad dyeing.

DYED BY OTHER METHODS: After-treated with chromium fluoride deepens the shade considerably. Chromed and coppered, much duller and yellower. After-treated with formaldehyde, no change in shade.

ON OTHER MATERIALS: Not suitable for wool or cotton-wool unions. Silk is only dyed slightly, and therefore the color is suitable for cotton-silk unions.

PRINTING: Suitable for printing with acetic acid on slubbing.

DISCHARGING: May be discharged with tin and zinc.

COMPETING PRODUCTS: Made in the United States by Garfield Aniline Works.

PONTAMINE FAST BLUE RL

(Schultz No. 451)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Salt and soda.

SHADE: Redder than S-456.

SHADE BY GASLIGHT: Redder and duller.

SOLUBILITY: Good; 30 parts per 1,000.

LEVEL: Good.

EXHAUSTS: Inferior to S-456.

FASTNESS TO:

Acid: Equals S-456.
Alkali: Equals S-456.
Boiling: Moderate.
Chlorine: Turns redder in two minutes in a 1½ per cent solution.
Ironing: Damp, good. Dry, redder.
Light: Excellent.
Perspiration: Fast.
Rubbing: Fast.
Washing: Moderate, like S-456.

SENSITIVE TO METALS, LIME: After-treatment with metal salts alters the shade to a duller blue. The fastness is not enhanced by this treatment.

OTHER PROPERTIES: Suitable for pad dyeing.

ON UNIONS: Cotton-wool unions: The wool is much redder.

ON OTHER MATERIALS: Suitable for silk-cotton unions. The silk is lighter.

DISCHARGING: Gives a good discharge.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co.

ACID ANTHRACENE RED 3B

(Schultz No. 400)

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Direct or top-chromed.

SHADE: Bright red.

LEVEL: Not good; only for self-shades.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Fast.
Alkali: Fast
Carbonizing: Fast.
Cross-Dyeing: Not suitable.
Fulling: Very good, even without top-chroming; better than the Wool Reds.
Ironing: Fast.
Light: Moderate; the wool reds are better.
Perspiration: Moderate.
Potting: Moderate.
Steaming: Fair.
Street Dirt: Fast.
Sulphur: Fair.
Washing: Fast.

SENSITIVE TO METALS, LIME: Copper saddens the shade.

DYED BY OTHER METHODS: Top-chromed, no faster.

ON UNIONS: Wool dyed in a neutral bath.

ON OTHER MATERIALS: Silk: Weighted or unweighted, suitable. Fairly fast to water and washing. Better tannined.

PRINTING: Well adapted for printing woolen pieces and for vigoureux. On slubbing the color may be printed sour and also with chrome, by which the fastness to fulling is increased. Sour dyeings on wool pieces discharge white with hydro and also with zinc dust. Yellowish with tin salts. Can also be used for silk printing.

COMPETING PRODUCTS: Made in the United States by Garfield Aniline Works, Inc.

EOSAMINE

(Schultz No. 100)

COMPOSITION: Monazo.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Acid.

SHADE: Underhand, a yellowish red; overhand, a bluish red.

SOLUBILITY: Good.

LEVEL: Level dyeing color, much better than S-95.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Fast.
Alkali: Fast.
Fulling: Shade becomes weaker and duller, and bleeds badly into white.
Light: Very good.
Rubbing: Fast.
Sulphur: Fast.
Washing: See "Fulling."

DYED BY OTHER METHODS: May be after-chromed; by this treatment it becomes darker and duller, but very fast to fulling.

ON UNIONS: Cotton-wool unions: The color does not go on the wool in a neutral salt bath. Wool-silk unions: The silk remains almost white.

ON OTHER MATERIALS: On silk: Dyed with sulphuric acid, the color is not fast to water on this fiber.

PRINTING: The color is suitable for vigoureux printing and prints a bright scarlet shade with a bluish tone. Can be printed acid or with chrome, but is only moderately fast to washing and fulling. Not suitable for silk printing.

DISCHARGING: Discharges white with zinc dust. With hydrosulphite the white is not satisfactory. Discharges a cream shade with tin crystals.

COMPETING PRODUCTS: Made in the United States by Newport Chemical Works, under name of Eosamine.

THE HISTORY AND DEVELOPMENT OF BRONZE PRINTING

(Continued from page 80)

D. R. P. 198,463 of H. Schmid, of Muehlhausen. Bronze powder is mixed with a solution of cellulose in ammoniacal copper oxide, printed, dried and the copper removed by acidifying. The metallic luster is produced by calendering with friction.

Lacquers consisting of solutions of celluloid or guncotton dissolved in amyl acetate or alcohol were also proposed as fixing agents. One part bronze is mixed with two to three parts of lacquer and the mixture printed and dried. The bronze is fixed through evaporation of the solvent.

Reuhl employed collodion (a solution of nitrocellulose in amyl acetate) in a similar manner.[10]

Acetyl cellulose is of particular importance for the fixing of pigments. This substance is prepared by the action of glacial acetic acid and acetic anhydride in the presence of concentrated sulphuric acid on cellulose. The di-acetate is first formed, which is converted into the triacetate. Acetyl cellulose dissolves in a number of solvents to form a thick mass, quite suitable for the fixing of pigments. Such solvents are: Acetic acid (over 8 deg. Be. in strength), acetone, ethylene tetrachloride, chloroform, tetrachlorethane, dichlorhydrin, ethylene chlorhydrin (method of the BASF), a mixture of alcohol and resorcin, and, finally, a 23 per cent solution of calcium thiocyanate.

The Farbenfabriken vorm. Fried. Bayer & Co. have been working on the application of such solutions in textile printing for the past twenty years. They introduced into commerce a special acetyl cellulose under the name "Sericose L." For bronze printing the following recipe was recommended (shade card No. 2216, 1913):

120 gm.	Sericose L
240 gm.	resorcin
160 gm.	water
480 gm.	alcohol
1,000	

Stir until a uniform mass results. One hundred and fifty grams bronze powder are added. A rapid aging fixes the bronze quite fast.

In February, 1924, Bayer introduced an improved product, "Sericose LC Extra," that is almost twice as efficient as the older L brand. At the same time, a new solvent called "Enodrin" was recommended. Enodrin is a chlorhydrin, already referred to as a solvent for acetyl cellulose. The new sericose solution is prepared as follows:

90 gm.	Sericose LC Extra
455 gm.	water
455 gm.	Enodrin
1,000	

The bronze printing paste is prepared by mixing 100 or 150 gm. bronze powder with 900 or 850 gm. sericose solution. A short grinding of this color is an advantage. With the proper quality of bronze, the printing can be done without a brush furnisher; the color will not remain in the engraving.

After printing, the goods are merely dried. The goods must not remain in contact with heated surfaces for any great length of time, as under certain conditions hydrochloric acid is liberated from the chlorhydrin and may attack the fiber. Small amounts of chalk or soda added to the printing paste will prevent danger. After printing, the engraving is cleaned with a mixture of Enodrin and water (1:1). This simple process is at present the best and safest. Colored bronzes are fixed quite easily in the same manner.

REFERENCES

[1] Die Druck- und Faerbekunst in ihrem ganzen Umfange, Vienna, 1849, Vol. 2, p. 99, and Das Neueste in der Druck- und Faerbekunst, Berlin, 1862, pp. 72-75.

[2] Lauber, Handbuch des Zeugdruckes, 4th Ed., Vol. 1, p. 173.

[3] This process was first described by Kurrer in Das Neueste in der Druck- und Faerbekunst, Berlin, 1862, p. 75.

[4] Oesterr. Wollen- und Leinen-Industrie, 1917, pp. 234 and 243.

[5] See article by Oldroyd and Blakely, Lehnes Faerber-Zeitung, 1914, p. 338.

[6] Lauber, Zeugdruck, Vol. 1, p. 175.

[7] Berichte der Ind. Ges. zu Rouen, 1907, p. 288.

[8] Sealed communication of the Muehlhause Society, No. 2213, Nov. 26, 1912.

[9] Lehnes Faerber-Zeitung, 1914, p. 63.

[10] Lehnes Faerber-Zeitung, 1914, p. 338.

CHROMOTOL COLORS FOR WOOLEN GOODS

The Dunker & Perkins Company, of 263 Summer Street, Boston, Mass., has brought out a complete line of one-dye chrome colors, known as "Chromotol Colors." These colors are similar to pre-war chromotol colors, and are especially adapted to the coloring of woolen and worsted goods, as they are said to go into the fiber slowly and dye very level.

The best method of coloring is to use the required amount of dyestuff, which is previously dissolved and is then added to the dye bath. Five to ten per cent of acetate of ammonia is then added and one-half as much bichromate of potash as color is also added to the dye bath. The bichromate of potash should also be previously dissolved before adding same to the dye bath. The temperature of the dye bath should be about 120 deg. Fahr. when the goods are entered. The steam is then turned on, and the goods are raised slowly to a boil, and after they have been boiled for thirty minutes the dye bath can be exhausted by the addition of acetic acid.

The amount of acetic acid used will vary with the percentage of color used. Shades requiring up to 1 per cent of color should be cleared with 3 to 5 per cent of acetic acid, and heavier shades should be cleared with 5 to 10 per cent of acetic acid. For very heavy shades it will be necessary to use 10 to 15 per cent of acetic acid. The dye bath should be cooled down by the addition of a little cold water to the dye bath, and the acetic acid should be diluted before adding same to the dye bath.

The steam is then turned on and the goods are allowed to boil for three-quarters of an hour to an hour longer. The complete boiling time should be from one and one-quarter to one and one-half hours.

The advantage of using these colors is, according to the announcement, that the goods are left in better condition than when top chrome or bottom chrome colors are used, and the goods can also be shaded in the dye bath as the true shade develops while the goods are dyeing, and the dyer can feed on these colors in much the same manner as he would an acid color. After an addition of dyestuff has been made to the goods, it is advisable to boil same for thirty minutes so that the color fed on will have a chance to fully develop.

The chromotol colors are described as fast to fulling, scouring and light, and the line is complete, so that any desired shade can be obtained.

NEWPORT PRODUCES NEW BROWN

A recent leaflet issued by the Newport Chemical Works, Inc., describes the properties of Newport Light Fast Brown 3YL, the most valuable property of which is stated to be its excellent fastness to light. This feature makes it of particular interest for dyeing cotton or rayon for drapery, upholstery fabrics, etc., either as a self-shade or in combination with other fast-to-light colors. It is further said to possess good solubility and level dyeing qualities, and is therefore valuable for dyeing cotton piece goods or union materials. Its fastness to steaming is described as excellent, and it discharges clear white.

TWO NEW PEERLESS COLORS

Two new inserts for the attractive little leather ring binder recently distributed by the Peerless Color Company, Plainfield, N. J., describe the dyeing properties of two additions to the Peerless range of colors, Direct Fast Yellow FF and Direct Fast Violet 4B. These shades are shown on silk swatches attached to the insert.

The first, Direct Fast Yellow FF, is described as an extremely fast direct yellow suitable for all classes of material. It is said to find considerable application in shading sulphur and even vat colors, as it can be used in the same bath. It is unaffected by sodium sulphide or hydrosulphite. In dyeing wool and silk it is said to give results of extreme fastness to washing.

Direct Fast Violet 4B is described as a clear bright dye used principally as a shading product and for the production of delicate lilacs and heliotropes. It dyes cotton and rayon, as well as animal fibers, but leaves Celanese white.

Both leaflets give complete dyeing directions and fastness properties of the colors.

Technical Notes from Foreign Sources

Dyeing Wool with Alizarine Black WX Extra

Woolen yarn which is wound on bobbins is dyed in open vats or in machines in deep solid shades by means of the bisulphite compound which is formed from Alizarine Black WX Extra, or Alizarine Brilliant Black in the presence of formic acid. For example, wool is dyed at a temperature of 60 deg. Cent. for a period of thirty minutes in a bath which contains 1 per cent of the coloring matter and from ½ to ¾ of a per cent of sodium bisulphite of 49 deg. Be. concentration, density 1.39. Then after the addition of 1 per cent of an 85 per cent formic acid, the dyeing is continued for another three-quarters of an hour at a temperature of 100 deg. Cent. and another 1 per cent of formic acid is added at the end of fifteen minutes.

The dyed wool is afterward chromed at a boil in a ½ to 2 per cent solution of sodium dichromate. Successive proportions of wool may be dyed in the same bath. Unsatisfactory dyeings are obtained when formic acid is replaced by sulphuric acid or acetic acid.

Dyeings which are faster to rubbing than those which are produced by the above method are obtained by dyeing wool with Alizarine Black WX Extra in the presence of ammonium sulphate, or ammonium acetate and sodium sulphate, the addition of an acid being unnecessary.

For example, wool is dyed black by immersion for half an hour at a temperature which varies between 40 and 45 deg. Cent. and then for another hour at a temperature of 100 deg. Cent. in a bath which contains 8 per cent of Alizarine Black WX Extra, 2 per cent of crystalline ammonium sulphate, and 5 per cent of crystalline sodium sulphate, being afterwards chromed with a 2 per cent solution of sodium dichromate. Inferior dyeings are obtained when ammonium sulphate is replaced by sodium sulphate and acetic acid. Wool is not deleteriously affected when subjected to the action of boiling dilute formic acid, and the latter does not decompose the bisulphite compound of Alizarine Black WX Extra. Ammonium sulphate is more effective than ammonium acetate in pormoting the exhaustion of the dye bath as described above. (Bull. Soc. Mulhouse, 1925, 91, 402-3, 404-4.)

Combined Shades on Vegetable Fibers

The processes which are described in the main patent, British Patent No. 228,510 and in British Patent No. 228,514, according to which combined shades of vat coloring matters and insoluble azo dyestuffs derived from 2: 3-hydroxynaphthoic arlyides or the acylacetyl compounds described in British Patent Nos. 211,722 and 211,814 are produced, are extended to the use of any other coupling components which can be padded, printed or dyed on vegetable fiber and developed with diazo compounds. Such components are beta naphthol acylaminonaphthols, carbamides of 2:5:7-aminonaphtholsulphonic acid, derivatives of 1-hydroxynaphthalene-4-carboxylic acid, pyrazolones, derivatives of beta-ketonealdehydes such as acylacetic arylides, and coloring matters which can be developed with diazo compounds. The fiber may be padded or printed with a mixture of a nitrosoamine salt, a coupling component, and the ester salt of a leuco vat dyestuff and the oxidized. Or the coupling component and leuco ester salt may be applied and overprinted or padded with a diazo solution. Or the coupling component may be applied and overprinted or padded with the leuco ester salt and the diazo compound successively or together. (British Patent No. 230,222.)

Dyeing with Ice Colors

In developing ice colors with diazo solutions which are neutral or alkaline with sodium carbonate, there is added to the diazo compound a substance which will destroy the caustic alkali present in the padded material without acidifying the bath. Such a substance is an alkali bicarbonate or a suitable metal salt, for example, magnesium sulphate, zinc chloride, or the two together; decomposition of the diazo bath is thus diminished, especially in continuous dyeing or when using tetrazo compounds. (British Patent No. 230,029.)

Treatment of Fibers Preliminary to Spinning

A process is patented in French Patent No. 578,702 which is concerned with the preliminary treatment of various textile fibers, such as linen, hemp and tow in the spinning process.

These fibers during the progress of the preliminary operations of carding, combing and the like are subjected to the action of various chemical reagents which have a cleansing and bleaching action on the fibers. This treatment makes it possible to obtain a large proportion of fine fibers and makes it possible to remove the difficulties due to dusting and the like which have the result of soiling the fibers during the ordinary spinning process.

The methods of applying these processes are as follows:

The skeins of linen yarn, for example, are rolled up on large spools instead of being put into pots. These spools are placed on perforated spindles. The yarn is wound up on the spool in the crosswise manner and this gives a mass of fibers which are readily penetrated by the chemical reagents. The liquors are circulated through the apparatus by means of suitable pump.

It is also possible to make the liquor penetrate

through the spools instead of immersing the spingles on which the spools are placed in the liquor in a vat.

Dyeing Textiles with Ink Colors

An interesting process is patented in French Patent No. 577,991 which has for its purpose the dyeing and coloring of all kinds of textile materials with the coloring matters that are commonly employed in the manufacture of inks.

Two examples are given which clearly indicate the manners in which this process may be applied in practical work.

In the first place two solutions are prepared. The first solution contains 60 grams of ferrous sulphate in 200 c.c. of water. The second solution consists of 16 grams of gallic acid which are dissolved along with 25 grams of tannic acid in 100 c.c. of water. The material that is to be treated by this process, cotton for example, is first washed in a solution of soda ash then impregnated with the first liquor, as described above. This is accomplished at the room temperature. Then the cloth is passed through the second liquor and allowed to remain there for a period of ten to twenty minutes at a temperature which varies between 70 and 90 deg. Cent.

After this treatment the goods are boiled with a soap solution and then well rinsed in water.

The two different parts of this treatment are repeated once or three times, and in this manner there is obtained a color which is quite resistent to the action of soap solutions and of light. The color is a dark black shade.

The number of passages of the goods through the aforementioned baths of reagents determines the intensity of the black color that is produced on the fabric.

That part of the process which concerns the action of air on the color to develop the black shade can be dispensed with when a current of air is allowed to circulate through the bath containing the second reagent. Or this stage of the process may be replaced by immersing the goods in a dilute solution of an oxidizing reagent, for example, a solution of 0.01 per cent of potassium permanganate. The second bath can be replaced by a solution which contains 60 grams of an iron salt, 16 grams of gallic acid and 25 grams of tannic acid all dissolved in 5 liters of water, but in this case losses of gallic and tannic acids are incurred.

In another example artificial silk is saturated with a solution of chloride of iron of 0.1 to 1 per cent concentration and by treatment with a solution of potassium ferrocyanide of ½ per cent concentration it is possible to precipitate Berlin Blue on the substratum, when the process is carried out at the ordinary temperature. The goods are then rinsed in water and dyed at a temperature of 80 deg. Cent. for a period of ten to thirty minutes in a bath which contains 800 c.c. of water, 75 grams of tannic acid, 24 grams of gallic acid and 90 grams of sulphate of iron.

One treatment of the goods in this dye liquor is sufficient. In this manner there are obtained perfectly stable deep bluish black shades. In the place of carrying out the preliminary dyeing with the aid of Prussian Blue, all other metallic colors can be used that are of the sort that can be produced on the fiber by the reaction between various chemicals. Thus colors can be formed by combinations of chromium, nickel, iron, lead and copper salts.

The various proportions which have been given in the aforedescribed examples can be modified to suit conditions within very wide range.

Reserve Process for Immunizing Textile Materials

In British Patent No. 233,704 there is described a process for the immunization of all sorts of textile materials such as fibers, yarns, fabrics and the like by a reserve process.

Reserve effects are produced by local esterification of vegetable fibers in the form of yarns, loose material, or fabrics. The material is printed with an alkalizing agent, such as concentrated alkali, with or without a thickening agent, alcohol, or an alcoholic solution of an alkali acyl oxide, then a dry or moist esterifying agent, such as an acyl chloride or anhydride or a sulphochloride is applied, and finally the material is washed.

A white reserve on a colored ground is obtained by subsequent dyeing with a substantive coloring matter and a colored reserve on a white or color ground by mixing an excess of the coloring matter with the alkalizing agent, with or without subsequent dyeing, by subsequently dyeing the reserved parts with basic coloring matters, gallocyanine derivatives, or certain acid coloring matters. Or then again the whole may be dyed in a bath which contains both a substantive and an acid coloring matter.

Mottled effects may be obtained by local esterification of loose material or yarns, working up with woolen fibers and dyeing first with a basic coloring matter and then in a bath which contains both a substantive and an acid coloring matter. Azo coloring matters may be formed in the esterified parts of the fibers by applying salts of diazotizable bases, diazotizing and developing. Batik effects may be obtained by covering the esterified parts with a resist and dyeing with a basic coloring matter, with or without subsequent dyeing of the ground with a substantive color.

Carbonizing Woolen Fabrics

Woolen fabrics which have first been scoured with the aid of soap and soda, are then carbonized by immersion for a period varying between one and two hours in a cold solution of chloride of zinc in concentrated hydrochloric acid. The material is then centrifuged and immersed for a period of fifteen minutes in an aqueous 15 per cent solution of sodium bisulphite, and afterwards the material is completely freed from the acid by washing with cold water. The fin-

ished material is claimed to have a silky handle and an increased affinity for coloring matters. For further details see Melliand's Textilberichte, 1925, volume 6, pages 97-98.

Treating Artificial Silk

It is known that it is not possible to mercerize artificial silk in the usual manner. However, when the silk is first treated with a protective agent, such as gelatine, then with the customary mercerizing liquor and finally with a dilute solution of an acid for the purpose of removing the alkali, very valuable results are obtained. The surface of the artificial silk then becomes covered with streaks and cross-swellings, so that reflected light is broken up in a very unusual manner and the artificial silk assumes the appearance of a natural silk. On the other hand, the strength of the artificial silk is not impaired by the treatment.

If the treatment is carried out on the goods while they are being stretched at the same time, then the change in the structure of the textile does not take place to the same degree as before. Furthermore as an additional protective agent it is also possible to add to the mercerizing bath glycerine. Under certain given conditions it is recommended that the glycerine which is employed as the protective agent be made more difficultly soluble in water by first subjecting it to preliminary treatment with the aid of aluminum acetate.

For further details see German Patent No. 412,164.

Vat Dyeing of Piece Goods

The dyeing process, carried out with the aid of vat colors is subject to a certain disadvantage due to the high price of these colors, particularly the new vats; and, furthermore, there is the added disadvantage that the process of dyeing with these dyestuffs is not yet definitely defined. The process is nevertheless a simple one. On the other hand, it is possible to obtain colorings on cotton cloth, for example, which possess a fastness of a degree that can not be secured with any other dyestuffs.

The vat dyeing of the difficultly soluble vat colors found on the market is mostly effected with the aid of hydrosulphite and offers no great difficulty if the directions that apply to each individual color are carefully carried out in the dyeing process. This refers particularly to maintaining the proper temperature during the process. The vat obtained by reduction, namely, the solution of the easily water soluble leuco compound of the vat color in question, has in general a color which is completely different from the one that it is desired to produce on the fiber. We are quite familiar with this phenomenon in the case of Indigo whose vat is a golden yellow color.

The author in the original article which was published in Deutsche Faerber Zeitung, 1925, divides piece goods dyeing into three parts. The first is the preliminary treatment which is concerned with the bleaching or at least the wetting down of the textile fabric. Then comes the dyeing process in fine which is carried out in a dyeing apparatus of proper design, guide rolls, etc. The third step in the process is the aftertreatment which embraces the processes of acidification, washing and reoxidation. The latter may take place with the aid of the oxygen in the air or in certain individual cases with the help of auxiliary agents such as potassium chromate or sodium perborate. In the original article there are given two examples of dyeing with Indanthrene Golden Orange G and Thioindigo Blue 2G. The vat of the first named dyestuff is red and that of the second is yellow brown. The maximum temperature attained in the dyeing with the first coloring matter is 60 deg. Cent. and with the second 50 deg. Cent.

Uniform Dyeing of Cotton Piece Goods

In Deutsche Faerber Zeitung, 1925, page 58, there are described the details that must be carried out in securing even dyeings of cotton piece goods. This is, after all, the most important consideration in the piece dyeing process. The preliminary treatment to which the goods are subjected has a great deal to do with the success of the dyeing itself. One important detail is the complete removal of the sizing materials, which is carried out mostly by means of diastafor. Oils fats and waxes when present in the textile must be removed by bucking with dilute solutions of the alkalies. Another preliminary condition is an even wetting of the fabric with soft water free from lime and iron salts. In the dyeing process, moreover, it is also necessary to take into consideration the character of the textile. Thus in the case of tightly woven fabrics which are being dyed with difficultly soluble coloring matters it is advisable to add wetting agents to the dye liquor, such as Turkey Red oil and the like.

Printing Process

According to German Patent No. 386,032 in the printing of solid shades on fabrics, when very soluble coloring matters are employed, acids such as lactic acid, malic acid, oxalic acid, either alone or in admixture with other acids are employed. The printing is then conducted at the ordinary temperature and the coloring matters which are thus applied are then fixed by steaming.

PRATT ALUMNI BANQUET

The nineteenth annual banquet of the Alumni of Industrial Chemical Engineering of Pratt Institute, Brooklyn, N. Y., will be held at the Chemists Club, 52 East Forty-first Street, New York City, on Saturday evening, February 20. The speakers will be Dr. Charles L. Reese, chemical director of the Du Pont Company, and K. G. Mackenzie, president of the Chemists' Club.

This organization has held these banquets at the "Club" for many years, and indications this year point to the most successful affair in the history of the association.

THE REDUCTION PRODUCTS OF AZO DYES

(*Continued from page* 101)

1.0357 at 25°. Easily sol. in cold H_2O and org. solv.; volatile with difficulty with steam.

Hydrochloride, deliquescent leaflets.

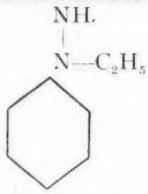
Acetyl deriv., slender, white needles (H_2O), mpt. 132.3°.

Decomp. into methyl chloride and *p*-phenylene diamine in stream of HCl at 180°.

Oxidized with bichromate in presence of thiosulfate it gives Bindschedler's green and, finally, methylene blue. It also gives the latter dye when oxidized with $FeCl_3$ in presence of H_2S. Oxidized with bichromate with the m-isomer it gives a violet-red dye.

If a sol. is boiled and passed through a filter impregnated with $Hg_2(NO_3)_2$ the filter is colored green on cooling.

No. 89.—UNSYM. PHENYLETHYLHYDRAZINE



$C_8H_{12}N_2$; Mol. Wt. 135.14; (C, 71.1%; H, 8.2%; N, 20.7%).

Derived from C. I. No. 125 by partial reduction.

Volatile oil, bpt. 237°. D = 1.018 at 15°. Reduces Fehling's sol. only when warmed.

Oxidized by HgO to diethyldiphenyltetrazon, monocl. cryst., mpt. 180° (decomp.).

Hydrochloride, leaflets, mpt. 137°, readily sol. in C_6H_6 and ether. Combines with dicyandiamine to give ethylanildiguanide, mod. sol. in H_2O but pptted. by KOH, readily sol. in org. solvs.

Benzoyl deriv.: fine white needles which melt at 167-8°. Its alcoholic sol. reduces ammon. silver solutions and decolorizes alkaline $KMnO_4$ sols. immediately.

THREE NEW INDANTHRENES

The General Dyestuff Corporation has issued circulars describing fully three new additions to the Indanthrene series of dyestuffs manufactured by the I. G. Farbenindustrie Aktiengesellschaft. These new colors are Indanthrene Printing Red G Paste, Indanthrene Printing Red B Paste and Indanthrene Yellow GF Paste.

It is explained in a note attached to the folders that up to now the series of Indanthrenes lacked bright and full reds which could replace the wellknown Turkey Red produced with Alizarine Red. This gap is filled by the two new brands, Printing Red G (yellow shade of red) and Printing Red B (bluish shade of red). In addition to being suitable for direct printing these new colors padded in light shades are said to be suitable for discharge work.

Indanthrene Yellow GF Paste is said to have excellent fastness properties, particularly against washing and boiling with soda. It is stated further that it combines and works very well with the other Indanthrenes.

The folders give full information about the properties and methods of dyeing each color and show the shades on swatches.

THE DYER'S SCHOOL OF EXPERIENCE

(*Concluded from page* 88)

and resist, they naturally obeyed those instructions, with the same results which I had in those first six months. I am also quite certain that if the office people there had taken an interest in what I tried many times to teach them, and had learned how to write instructions on the tickets as the work required, they would still be running their dyehouse.

The North Carolina State College Textile School was well represented at the meeting of the Southern Section of the American Association of Textile Chemists and Colorists held in Burlington, N. C., Saturday, January 23, 1926.

Dr. E. C. Brooks, President of the College, was the principal speaker of the evening.

Thomas Nelson, Dean of the Textile School, and Professor A. H. Grimshaw, of the School Dyeing Department, were also present and participated in the discussion. They were accompanied by six members of the Senior class who are specializing in textile chemistry and dyeing.

RESEARCH CHEMIST

Graduate chemist desires position as assistant to research director engaged in investigations of value to the textile trade. Ten years' experience in the textile laboratory. Address Box 326, American Dyestuff Reporter.

WOOLEN AND WORSTED DYER

With mill training; conversant with all kinds of woolen machinery and full knowledge of chrome and acid dyestuffs and their application to all fabrics. For mill demonstrator in New England; located at Providence. Reply to Box 327, American Dyestuff Reporter.

DYESTUFF OVERSEER

Wanted—Dyestuff overseer, thoroughly familiar with the handling and dyeing of piece goods, including glove silk, wide tubular and woven broad silk goods. Must be real live man capable of getting quality and production, able to handle and train labor and generally organize a dyehouse to run economically. State age, experience and salary required to Box 328, American Dyestuff Reporter.

PRINT WORKS CHEMIST

Textile print works chemist-colorist desires position as such or as superintendent or assistant. Over twenty years' experience. Best references. Address replies to Box 329, American Dyestuff Reporter.

Textile fibres under the microscope from a faulty spot in a fabric, due to processing in ordinary water. From an unretouched photomicrograph.

Textile fibres from the same mill, processed in Permutit conditioned water. From an unretouched photomicrograph.

How do your products look under the microscope?

LOOK well at the two photomicrographs of textile fibres above. They came from a mill whose name you would know instantly.

This mill has saved many thousand dollars through applying the lesson these pictures teach.

That on the left shows textile fibres that were processed in the mill's ordinary water supply. Nobody had ever questioned this water supply. It looked clean and pure. The employees drank it. For years the mill had operated on this water.

Yet under the microscope, note the clinging mineral deposits on the fibres. They showed up as a defect in the finished goods. And for these deposits the mill's water supply was directly responsible.

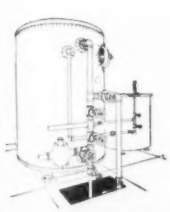
Realizing this, the mill consulted the Permutit Company, specialists in water conditioning. Upon the advice of Permutit Engineers, a Permutit Water Softener was installed. The mill's water supply was not what you might consider "hard," but it contained sufficient quantities of lime and magnesia to cause many of the mill's manufacturing troubles.

After the Softener was installed these troubles ceased. The fibres and cloth were clean and smooth, as you see them above to the right—entirely free from clinging deposits.

The experience of this mill is not an exceptional one. It has been repeated in hundreds of instances—in mills that are now saving money through operating on properly conditioned water.

It may be repeated right in your own mill. Perhaps you never have suspected your water supply as a trouble maker. But water is a great solvent. In flowing through the ground, passing over rocks, minerals, leaves, decaying vegetable matter, it dissolves many substances—substances that are not welcome in a textile mill. Even after you have analyzed your water supply and are sure it is pure today, that is no sign you can be sure of it tomorrow. A rain or a drought may change its mineral content completely.

If you are interested in knowing more about this very important subject, you should have our booklet, "Reducing Textile Costs and Troubles." It is full of valuable authoritative information for the mill man on the subject of water. Send for a free copy today, there is no obligation.



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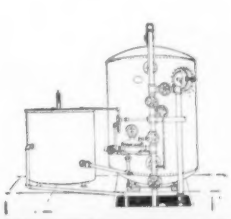
Take all the hardness out of water



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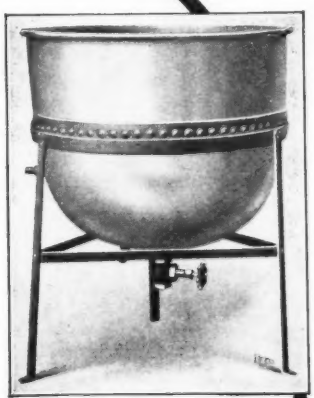

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If you want to know how a new hosiery pattern will look after it is dyed, or how a new shade will appear on one of your regular numbers—you'll find this "American" copper dye kettle particularly useful. It will dye sample lots of one, two, three or a few dozen stockings successfully and economically. Folio No. 719 gives full particulars—write for it.

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combines readily with all starches and far more evenly than Raw Tallow. It is neutral and non-odorous. Its ideal penetrating powers acknowledged.

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Index to Advertisers Appearing in This Issue

Althouse Chemical Co. .... —
American Aniline Products, Inc. III
American Laundry Machinery Co. XV
American Rapidase Co. XI
Amid Duron Co. XVII
Arabol Manufacturing Co. IX
Arkansas Co. XIV
Arnold, Hoffman & Co. —
Atlas Electric Devices Co. VIII

Bosson & Lane XIV
Brandwood, John, & Son XV

Calco Chemical Co. IX
Campbell, John, & Co. VI
Carbic Color & Chemical Co. XVI
Ciba Co. V
Corn Products Refining Co. —

David, S. R., & Co. —
Dunker & Perkins Co. VIII
Du Pont de Nemours, E. I., & Co. VII
Dyer & Calico Printer XVI

Fleischmann Co —
Fortner, L. B., & Co. —
Foster, Edward C. —
Franklin Process Co. Third Cover

Geigy Co., Inc. Front Cover
General Dyestuff Corp. IV

Hussong Dyeing Machine Co. —

Innis, Speiden & Co. XIV
International Nickel Co. —
International Salt Co. —

Jennings & Co. —

Kali Manufacturing Co. XVII
Klipstein, A., & Co. Second Cover

Lewis, John D. —

Malt-Diastase Co. XIV

National Aniline & Chemical Co. XII
Newport Chemical Works Back Cover
New York Color & Chemical Co. V

Oakley Chemical Co. VIII
Onyx Oil & Chemical Co. XVII

Permutit Co. XIII

Roessler & Hasslacher X
Rohm & Haas Co. VI

Sandoz Chemical Works —
Society of Dyers and Colourists —
Solvay Process Co. XVII

Textile Finishing Machinery Co. —
Tolhurst Machine Works —

United Chemical Products, Inc. XV
U. S. Color & Chemical Co. XVIII

Vellner, Eugene XI

Wolf, Jacques, & Co. —

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You will find that even an inch space is very *profitable* in this market. Try it.

American Dyestuff Reporter
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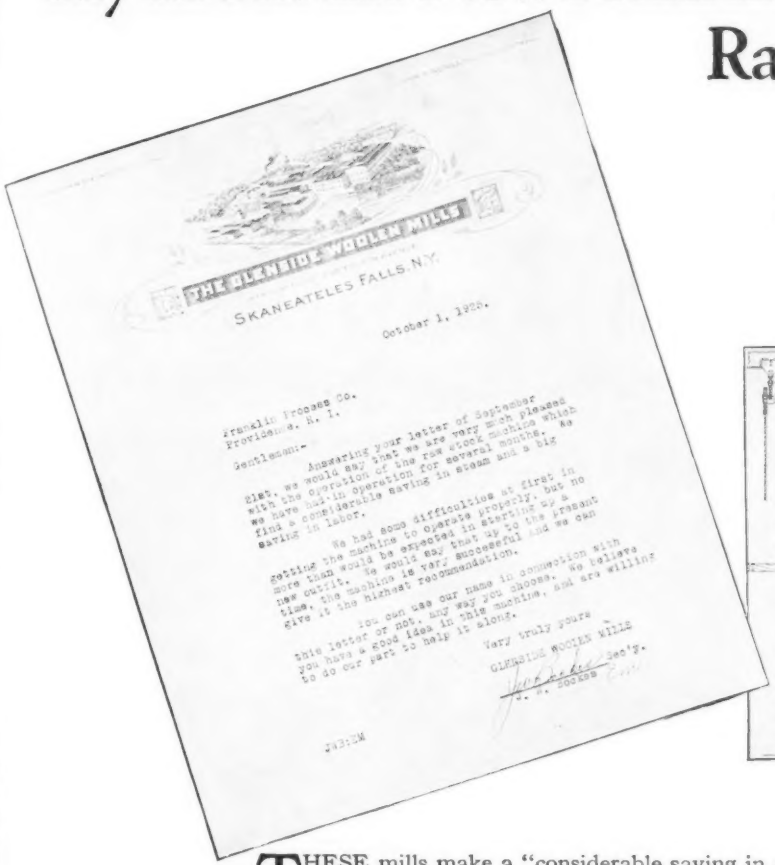
What the Glenside Woolen Mills say about the New Franklin Process Raw Stock Dyeing Machine



THE GLENSIDE WOOLEN MILLS

SKANEATELES FALLS, N.Y.

October 1, 1928.

Franklin Process Co.
Providence, R. I.

Gentlemen:-

Answering your letter of September 21st, we would say that we are very much pleased with the operation of the raw stock machine which we have had in operation for several months. We find a considerable saving in steam and a big saving in labor.

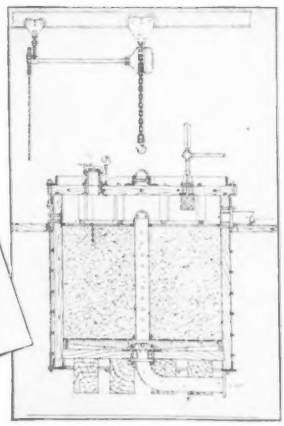
We had some difficulties at first in getting the machine to operate properly, but no more than would be expected in starting up a new outfit. We would say that up to the present time, the machine is very successful and we can give it the highest recommendation.

You can use our name in connection with this letter or not, any way you choose. We believe you have a good idea in this machine, and are willing to do our part to help it along.

Very truly yours

GLENSIDE WOOLEN MILLS

By H. H. Coates Sec'y.



THESE mills make a "considerable saving in steam" because the Franklin Process Raw Stock Dyeing Machine dyes in a closed kier, under pressure, with a concentrated dye bath—a gallon of liquor to a pound of stock.

It makes "a big saving in labor" because one man can look after the machine and have plenty of time for other work. In fact one man can operate as many as five or six Franklin Machines, requiring assistance for loading and unloading only. He can turn out two batches a day on chrome colors, and still more on other classes of work.

If you want to know other advantages of the Franklin Process Raw Stock Dyeing Machine—if you wish to find out why it is revolutionizing the dyeing practice of an industry—use the coupon below and get our booklet, "An Idea—and What Came of It." No obligation.

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